THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

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COVER: *One hundred and fifty pounds of welding electrodes were used in the construction of these 6,800-lb tanks for 5,000-kva transformers in the Allis-Chalmers Mfg. Co. shops at Milwaukee. Precise welding and special seam tests were required because of the very light insulating oil to be contained in the tanks. Transformers are rated at a high voltage of 140,000, low voltage of 44,000 volts.*

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THE WELDING ENGINEER

ESTABLISHED 1916 JULY, 1948

Our Priceless Heritage

THE FOURTH OF JULY isn't just a day of firecrackers, rockets, Roman candles and excursions to the country over crowded highways. For 172 years it has been celebrated as the birth date of freedom. Nowhere in the world has such freedom been enjoyed for so long a period of time as in the United States.

Our forefathers did not fully realize the birthright they were passing on to their children and their children's children. They were so unaware of our precious heritage that they were unable to make the most of their newly found freedom the first few years of the republic. False starts were made, but freedom finally came into its own with the writing of the Constitution of the United States. The key to freedom was found in the First Amendment:

"Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof, or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble and to petition the government for a redress of grievances."

Only 45 words, yet never in the history of mankind has so much been said. Freedom to worship as we please. Freedom to speak or write in criticism of those in power. Freedom to assemble publicly, to petition government . . . there is one startling exception in this list of freedoms. There is no freedom to suppress freedom.

Despite the enrichment of life made possible by the simple common sense of the First Amendment, there are those now living in America who would have us reject it. Instead, they advocate the adoption of one or another of the related ideologies born of the twisted brain of a frustrated revolutionary. Though this country is large, it has no room for such people nor for such thinking!

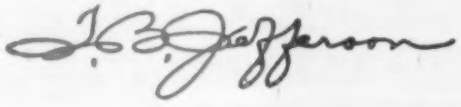
It is only because of the freedom granted by our Constitution that the disciples of Karl Marx are able to advocate the adoption of their foreign ideas. None of the nations they would have us ape would give them such freedom of speech or freedom of opportunity, so they stay here and try to pull down the house that supports them. Most of them are unable to see the paradox of this, so completely enraptured are they with their dreamland. America is not for them.

Seven times in the brief history of our nation we have proved that our freedom is no idle nor superficial thing. Thousands of Americans have gone into bloody fields of battle in order that the 45 words of the First Amendment may continue to bring security, peace and happiness to those who remain at home.

From a humble beginning, we have grown great. Because we believe that men should be free to think for themselves, speak for themselves and work for themselves, we have prospered as no other nation in history. The people of the United States, who occupy only 6% of the world's land area and represent less than 7% of the world's population, own and enjoy:

92% of all the modern bathtubs;
85% of all the automobiles;
60% of all the life insurance policies;
54% of all the telephones;
48% of all radios;
35% of all the railroad mileage;
30% of all the improved highways.

Freedom, happiness and good living are within the reach of every American. Let us keep it that way—the American way. Our traditional tolerance must no longer be extended to those whose cry is, "There is no God, and Karl Marx is his prophet." America has no room for these would-be wreckers of our priceless heritage.



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1—SIDE SHEETS of nearly pure copper were first placed in a vertical position to form the tank shell

2—CURVED PLATES of tank were pulled together by a ratchet lever hoist and held with keys and pins

COPPER TANKS

Welded by Inert Arc

THIS IS the first time, to the knowledge of either the writer or editors, that the inert-arc process was applied to the fabrication of large vessels of nearly pure copper. Mr. Jewell details the procedure that had to be worked out.

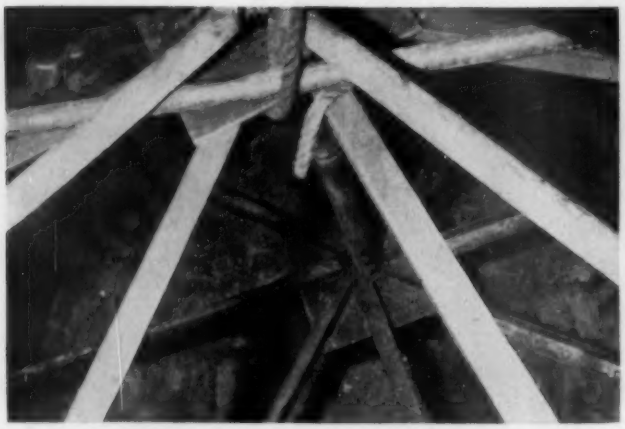
BY S. V. JEWELL, H. K. Ferguson Co., Chicago

THE problem was to fabricate four large copper tanks for the acid wash system of a large soap factory in the Chicago area. The erection and fabrication locality imposed obstacles of space limitation, unclean surroundings and high humidity. How these were overcome will be told in detail.

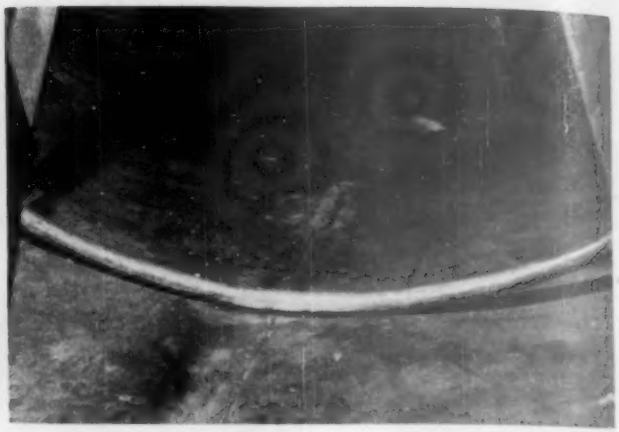
Of the several welding procedures available for the fabrication of these vessels, only one could meet all the requirements that the material and fabrication locality imposed. The welding methods considered were oxyacetylene, metal-arc, carbon-arc and inert-arc processes. Each of these will be briefly discussed.

Oxyacetylene Process

Because of its slow welding speed (about 2½ in. per minute), the oxyacetylene process would have promoted excessive grain growth. Other disadvantages are a probability of



3—CARTWHEEL JACKS, one at each end, kept tank rigid for handling and provided a means of alignment



4—INSIDE longitudinal seam was welded immediately after tacking. The shell has been laid on its side

High heat losses are involved when welding copper, but this difficulty was overcome by preheating. It was absolutely necessary to make all welds downhand

oxidizing both the filler and base metal, danger of cuprous oxide formation at grain boundaries, possibility of flux entrapment, excessive warping of the tank. Operator productivity would have been cut because of the large amounts of heat required and fit-up time would have increased because more jigging would be demanded. To obtain maximum corrosion resistance, this process would have necessitated a filler rod of a higher copper content than any other process. Since that rod's penetration and fusion characteristics are extremely poor, there would have been cold laps, gas pockets, overwelded joints. It would have been impossible to make even a fourth class weld on the tee-joint fillets that were specified on the manhole neck, vent chute and stiffener bars, not to mention the nozzles.

Metal-Arc Process

A few large copper tanks have been fabricated this way, but these are mostly of the 96% and lower copper content. An electrode of a lower copper content has to be used in order to incorporate sufficient deoxidizer and other stabilizers that will prevent the metal from losing its strength and corrosion resistance when going through the arc. Backup strips are required; then these have to be chipped off and back chipping done since cold laps, flux and gas occlusions and weld cracking are common. This process is mainly applicable to shop fabricated tanks, where the most efficient fabricating equipment and accessories are readily available and the personnel is more closely knit.

Carbon-Arc Process

The carbon arc is the standard method for welding all grades of copper. Its disadvantages are: (1) a continuous supply of properly tapered carbons has to be kept on hand; (2) flux has to be used; (3) there is danger of carbon pick-up from the electrode into the weld metal;(4) hydrogen liberation.

There are two sources of hydrogen liberation with the carbon-arc process. The gases surrounding the carbon arc consist mostly of carbon monoxide, carbon dioxide and nitrogen. Carbon monoxide is the chief culprit as far as the carbon arc is concerned because it pulls away oxygen atoms from the water vapor present in the air to form carbon dioxide and liberate free hydrogen. The second source of hydrogen is also the water vapor in the air but the cause is different. Under the high temperature of the arc, the water vapor may break down into

5—CHIPPING to sound metal was done from outside after an inside seam had been completed

6—GIRTH SEAM called for both a weldor and a helper with a preheating torch. Cramped quarters didn't make the job any easier

its component hydrogen and oxygen atoms.

A solution of hydrogen into copper is very apt to result in brittleness—"hydrogen embrittlement" is the metallurgical term. A more complete description will be given later on.

Inert-Arc Process

The inert-arc process has only one source of hydrogen to produce embrittlement — the breakdown at high temperatures. It was this process that was chosen for the copper vessels.

As is well known, this process utilizes an arc drawn between the base metal and a virtually non-consumable electrode of pure tungsten. The tungsten electrode is sheathed in a flow of inert gas which is breathed onto the molten metal. Argon and helium are the only two commercially available inert gases. A cylinder of argon will last two to three times longer than helium; though argon costs more, it is probably more economical in the long run. Because of the shield of inert gas, no flux is needed. This in itself is important because it precludes the possibility of flux entrapment with resultant corrosion. The welding current may be supplied by either a standard welding generator or an a-c welding transformer; if the latter is used, however, a high-frequency current should be superimposed on the welding current in order to give a greater arc stability. Most low-amperage welding transformers, especially the later models, have this feature already built-in in order to eliminate the difficulty of starting the arc on low amperage.

The advantages of alternating current are confined to aluminum and magnesium welding. For copper, stainless steel and nickel alloys, direct current gives greater speed and penetration. Another advantage is that d-c produces a narrower bead—a most attractive feature when welding the "hard-to-weld" metals.

Straight polarity must be used when welding copper with direct current.

The big advantages that inert-arc welding possesses over other methods are:

(1) A high concentrated heat (around 5,000 F) produces rapid fusion and results in high welding speeds.

(2) As a corollary of the above, the narrow heat-affected zone makes it possible to weld the unstabilized stainless steels without initiating carbide precipitation.

(3) Distortion and buckling are kept to a minimum.

(4) Besides copper, it is possible to weld other "hard-to-weld" metals, including aluminum and magnesium, without oxidation of the metal.

Inert-Arc Equipment

The welding equipment used at the Chicago soap factory consisted of:

A 600-amp d-c welding generator.

A Heliarc welding torch with water and gas hoses and current leads.

An oxygen regulator and flowmeter (for the argon).

A supply of clean cold water (for torch cooling).

A supply of compressed argon (about twenty cylinders or 4,400 cu ft were consumed).

The type of copper specified for the tanks was a 99.9% copper, ASTM B-11-44 Grade 1 or ASTM 152-44-T Type A. These types were not available, but it was discovered that a satisfactory substitute could be supplied. Even after accepting the substitute, a nine-month delivery date was set for the material.

The only difference in the specified type and the substitute is that phosphorus is added to the latter instead of silver. Phosphorus and silicon are the two standard deoxidizers for copper.

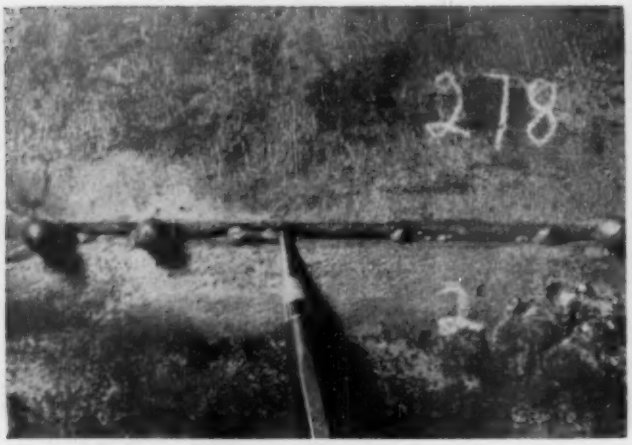
96% Cu Filler Rod

The ¼-in. filler rod was of a 96% copper alloy chosen because it offered the best combination of economical weldability and corrosion resistance. Composition is: Cu 96%, Si 3.90%, Mn 1%. This is a high-shrinkage alloy, and advantage was taken of the characteristic. The selection was based upon competitive tests made with another copper alloy. The methods of testing were: bend test, nick-break test and photomicrographic examination.

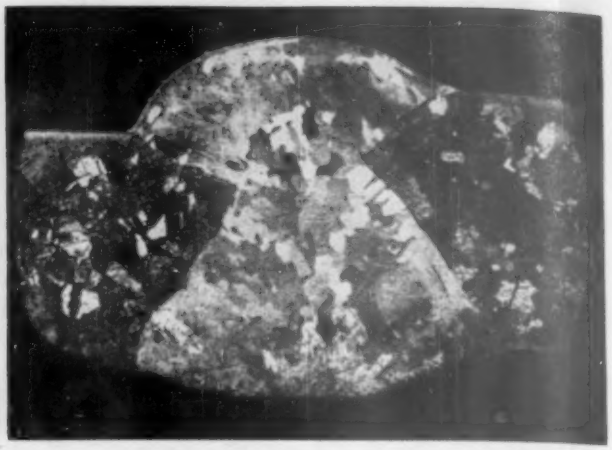
Of the three obstacles mentioned in the opening paragraph, that of space limitations was not too serious. Handling room was secured by breaking a hole in the concrete

7—MANHOLE neck being tacked. Neck was welded from the inside

8—WITH TANK TURNED UPRIGHT for the last time, appurtenances were welded to the head. Outside weld was also made on the manhole neck



9—EXCELLENT PENETRATION qualities of the 96% copper filler rod rendered it unnecessary to chip the longitudinal seams of the tanks from the inside



10—INTERPENETRATION of inside and outside weld beads is shown by this macrograph (9X) of an etched test plate. Note grain growth across boundaries

floor and digging a pit in which to turn the tanks. Some overhead piping also had to be rerouted. A carefully prepared plan of erection and welding sequences was worked out to reduce the amount of turning as much as possible. It should be borne in mind that copper has to be welded downhand; only in an emergency should it be welded in any other position.

Cleanliness Second Problem

The next most troublesome element was uncleanliness. This took the form of leaking overhead pipes, overflowing trap tubs, and air-borne dispersoids. Copper, like aluminum, has to be almost surgically clean in order to weld properly. Unless a constant and extreme vigilance was exercised, the handling of greasy welding cables, air hoses and small tools usually resulted in contamination of the weld groove. So severe was the contamination problem that the weld groove had to be cleaned with carbon tetrachloride and a power wire brush just ahead of the welder.

High heat losses are involved when welding copper because of its high thermal conductivity, but this difficulty was overcome by preheating the joints with an oxyacetylene heating torch. Adverse metallurgical changes (formation of cuprous oxide at the grain boundaries) are apt to be triggered by increasing the amount of heat necessary to execute a weld. The high thermal conductivity however, was not too troublesome.

Humidity was especially severe, usually running in the neighborhood of about 95% with a temperature average of 115 F. It was so hot that the automatic sprinkler system was once set off. Humidity in the air is a source of hydrogen because the water vapor in the ambient atmosphere breaks down at high temperatures. Since the arc atmosphere is in contact with the surface of the molten metal, the possibility of hydrogen dissolving into the molten copper is ever present. As the metal freezes, an upsetting of the equilibrium between the hydrogen and the oxygen already existing in the copper takes place. This reaction forms steam which is trapped within the metal. This condition is known as hydrogen embrittlement, and it can be seen under low-power magnification as porosity. The degree of embrittlement is dependent upon two factors: (1) The extent of internal oxidation (which can be brought about by overheating) and (2) the concentration of hydrogen.

Cuprous Oxide Trouble

Oxygen in excess of that dissolved in the solid copper exists in the form of cuprous oxide. This is generally harmless because it is dispersed evenly throughout the grains by the rolling operation. But when an attempt is made to force fusion of a weld by using high temperatures to break the oxide meniscus of the molten metal, this cuprous oxide migrates and collects at the grain boundaries. Any radical that has a greater affinity for cuprous oxide than copper will attack at these places. The result, of course, is lowered corrosion resistance.

Welding Procedures

It wasn't easy to secure a fabricator who had both the necessary equipment and personnel and who would tackle a field job of this size. It developed that the Chicago Bridge & Iron Co. had had some experience in shop fabricating a few Everdur tanks, including some by the inert-arc process. Everdur only has a copper content of about 96%, however, and is relatively easy to weld compared with the 99.9% copper specified for the acid wash vessels. Every effort was made to obtain data on using the inert-arc process on copper, but all sources were unanimous in the opinion that there was no precedent. The author, fully aware of the advantages of the process, decided to work out a procedure with the Chicago Bridge & Iron Co.

All heads, shells and appurtenances of the tanks were ¼-in. copper plate, preformed and prefabricated. Because of the extreme fluidity of molten copper, all welding had to be done in the flat downhand position, this consequently, was the governing factor in establishing the procedure. The side sheets were first placed in a vertical position (Fig. 1). Small holes were drilled near the vertical seams on each side, and tie rods were inserted so as to maintain the correct curvature. An air gun was employed to bevel the plate

edges 45 deg, leaving a 1/8-in. land. A ratchet lever hoist was used to pull the two halves together (Fig.2), which converted the weld groove to a 90-deg bevel with a 1/8-in. land. Steel plate of comparable thickness is usually beveled 65 to 70 deg with a 1/16-in. land.

Two cartwheel jacks with adjustable screw ends were installed—one in the bottom and one near the top. These jacks (Fig. 3) provided a method for alignment as well as the necessary rigidity for turning the tanks over. The heads were then fitted and tacked every 18 in. on the outside—the beveled side. All tacking was done without turning the tanks over. The keys and pins used for temporary holding (Fig 2) were taken out about three feet ahead of the tacking operation. The high shrinkage characteristics of the filler rod caused the edges to be butted tight when the tacks were cold.

After tacking, the vessel was laid on its side while the longitudinal seams were welded from the inside (Fig. 4). Inside welds were made in one pass each. No chipping was done on the inside welds, and no back-stepping of the weld was done either. The high shrinkage characteristic of the filler rod has a tendency to leave crater cracks unless the molten pool is choked full while the arc is broken. This technique and chipping could probably have eliminated the surface cracks, but it was feared that subsurface cracks might still exist.

Chipping to sound metal (Fig. 5) was done before welding the outside seams. Fig. 9 shows the excellent penetration characteristics of the filler rod, and Fig. 10 shows how inside and outside weld beads have penetrated into each other. In the latter illustration, note also the lack of porosity and grain growth across boundaries of the parent and the filler metal. This indicates perfect fusion and alloying A medium-sized grain can be seen. Oxyacetylene welding would have resulted in large columnar grain. Of course, the grain structure could be refined but at a higher total cost.

Grain Refinement Tests

Some tests were run to determine if this cost would be prohibitive. The theory is that work-hardened copper will recrystallize into finer grains upon heating for one to three minutes at temperature of 500 to 1,200 F. The higher the temperature, the shorter the heating period, and vice versa. Degree of work-hardening also has an effect. Care has to be exercised in heating, because if the temperature is held too long after recrystallization, a reversal to even larger than original grains will result.

The weld samples were peened on both sides, using a flatter in an air gun. They were then heated with an oxyacetylene torch to 1000 F. In spite of the severe cold working, the recrystallization only proceeded to a depth of about 1/8 in. The only way that these grains could have been completely refined would have been to weld each side with two passes instead of one, and hammering and heating between each pass.

After all the longitudinal and girth seams had been welded inside, the icicles that dripped through from the inside and the assembly tacks were chipped off. Girth seams were then welded from the outside (Fig. 6). Next the appurtenance holes in the side sheets were cut with a circular hole saw in an electric drill. These were welded in the flat position—a fillet weld on the outside and a groove weld on the inside. The sump was the only rolling fillet weld, and it was allowed only because the tank would have had to be turned upside down—too costly. However, an unexpectedly satisfactory weld was made.

The roof stiffeners were next installed. These gave the most trouble in the entire fabrication. As previously explained, preheating with an oxyacetylene torch had to be done immediately prior to the welding operation. This naturally created a hot creep, the so-called "diaphragm effect" in the head. Since there was a difference in mass between the head and the stiffener bar, a gap was produced between the two which would vary continuously from 1/32 to 1/2 in., depending upon the paths of the wandering steep thermal gradients. These stiffeners caused so much trouble and time that the author obtained permission to eliminate them from two tanks, and it is his belief that they could also have been eliminated from the other two.

The manhole neck was next tacked in place (Fig. 7) and welded on the inside, using a rolling corner weld. Before the head was attached, the spray piping anchors were welded to the shell and heads.

The tank was then set upright for the last time in order to make the inside weld on the sump, the outside weld on the manhole neck and the outside welds on head nozzles. Fig. 8 shows the welding of the appurtenances on the head. The only parts that were not welded on both sides were the upper head nozzles and the vent duct; the reason was again that it would mean turning the tank upside down.

Each tank was filled with water and allowed to set for at least 24 hours. Not a leak was discovered in any of the four.

No plugs or straps were cut out of this tank during fabrication. Quality was maintained, however, by submitting during actual welding test plates welded without a change of heat, rod or procedure. Only one weldor was qualified for this type of work.

Suggestions for Improvement

In the light of the experience gained on this job, the author believes that the manufacturing costs of these vessels would have been lowered considerably had more careful consideration been given to the following factors:

1. Fabrication should have been scheduled for cool weather to lower operator fatigue.

2. The fabrication site selected should take cleanliness and adequate handling space into account.

3. The method of attaching appurtenances and accessories should be changed in these respects:

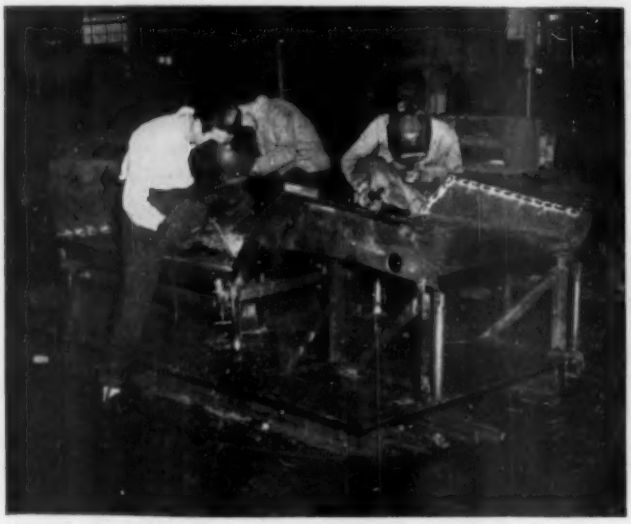
   (a) Eliminate stiffeners on heads.

   (b) Silver braze seat ring on manhole instead of welding it.

   (c) Fabricate manhole hinges out of steel instead of copper. Copper is too soft after heating.

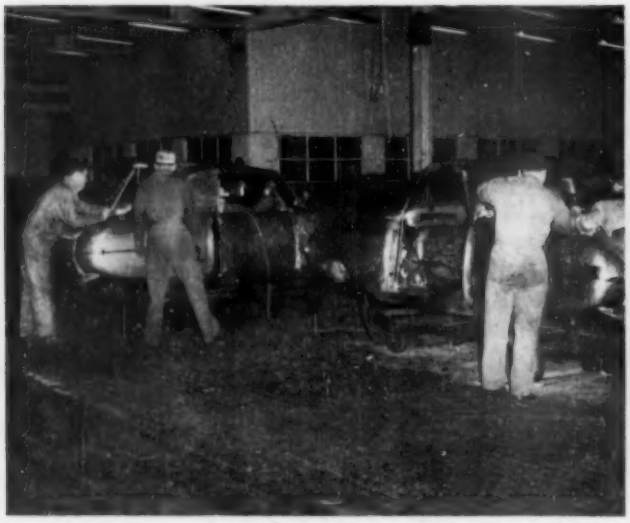
   (e) Weld nozzles inside by using a groove weld as recommended by the ASME Unfired Pressure Vessel Code.

   (f) Design coil-supporting brackets so that deep groove welds and tee fillet weld joints are eliminated. Lap joint fillet welds are easier.



BASE IS FABRICATED by arc welding box-type steel beams. Maximum strength and safety are thus provided

PILOT MODEL begins to near completion of body assembly. Production lines will utilize spot welding



ADDING BRACES and parts in the trunk compartment. All-welded body eliminates 900 bolts and nuts

BODY SOLDERING and grinding. The two pilot models move from station to station on mobile carts

CRUMPLED REAR section was caused by a high-speed collision with a heavy sedan. The all-welded body of Playboy kept its alignment and essential shape

FINISHED PLAYBOY is a three-passenger convertible of airflow design. Slightly narrower and shorter than conventional autos, it will sell at prewar prices

It's coming soon—an all-welded auto at a prewar price

Playboy Preview

What America needs is a good low-priced automobile. Here's one answer. Playboy's unique frame-and-body unit is easily mass produced by welding

BY WALTER RUDOLPH

THE automotive field's newcomer, Playboy, boasts of an all-welded body unit consisting of 48 pieces of 20-gauge steel, especially designed and stamped for welding. In the vast 318 by 2,084 ft plant at Buffalo (occupied by Chevrolet during the war to build aircraft engines), three or four final assembly lines hope to produce about 100,000 Playboys annually, one shift, with two shifts in the press department.

One of the initial steps in manufacture is the fabrication of an arc-welded base of box-type steel beams. This and other subassemblies will be brought together in a giant fixture and hydraulically clamped against positive stops for spot welding.

A Convertible Coupe

Here are the pertinent facts about the new car:

Playboy is a 40-hp, 2,035 lb automobile in the low-price class ($985 f.o.b. Buffalo). It is slightly narrower and 26 in. shorter than standard makes and is confined to one model—a single seat, three passenger, convertible coupe. Its all-steel top, hinged and counterbalanced, is drawn into place or put away with ease; when top is up, emergency passenger or storage space is available.

Wheelbase is 90 in., overall length 155 in. and overall width 59 in. A speed of 70 mph is obtainable, and 25 to 45 miles per gallon of gasoline have been rated from city and open road tests at conservative speeds.

Playboy Motor Car Corporation was organized in November, 1946. Officers are: Louis Horwitz, president; Charles D. Thomas, vice-president and secretary; Norman W. Richardson, treasurer. Between 1,500 and 2,000 employees will be needed when production reaches its peak.

Nothing is really experimental about the Playboy. Its original was developed by Charles D. Thomas, currently in charge of plant engineering. Many of the car's concepts date from 1937. An experimental model, today on the plant floor, was tested on Detroit automotive proving grounds and has been driven more than 200,000 miles.

The spacious rear compartment for luggage and spare tire is a welcome feature. An innovation is that brake and clutch pedals stem from the upper section of the dash panel instead of coming through the toe board.

The Playboy has 900 less nuts and bolts than its competitors. No nuts and bolts at all are used in its construction until engine and wheel assemblies are added. There are no door posts. Doors swing solidly in the all-welded body and can withstand a considerable stress.

Collision Survivor

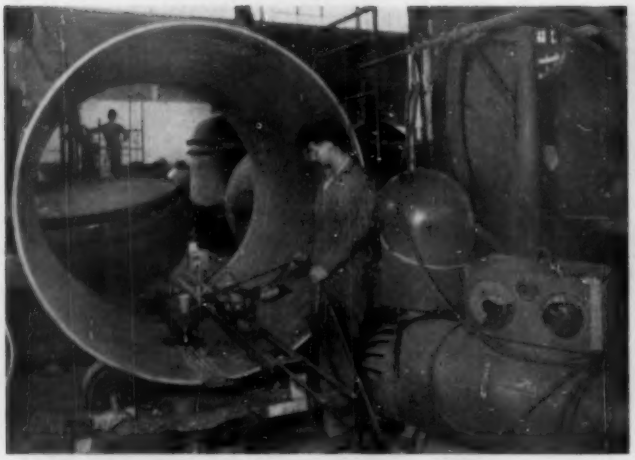
On the plant floor at present is a badly dented but not crushed Playboy that came out first in a high-speed collision with a large sedan. Hit in its right rear quarter, the Playboy was spun several times on its top, but the welded steel body withstood the crash though the large sedan was practically demolished. There was naturally a considerable distortion of the rear of the Playboy, but the lower section retained its original alignments so well that doors on both sides open and close freely.

Though the damaged Playboy is left in collision condition as an exhibit, the damages could be repaired through metal bumping operations or by cutting out body sections with the torch and welding new sections into place. The Playboy's body sections are such as can be readily handled in a dealer's parts stock.

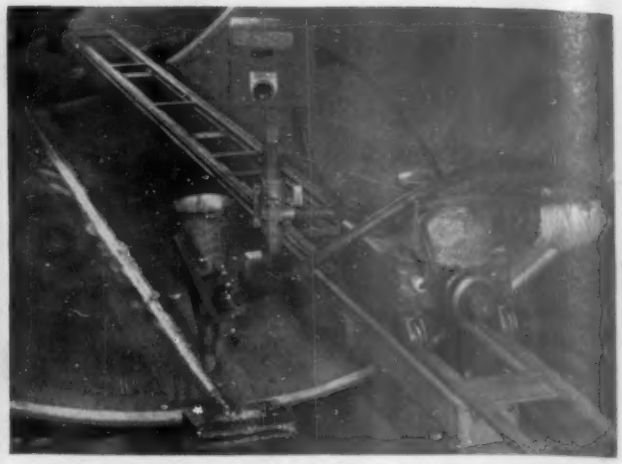
A New Market

Henry Ford's statement on the necessity for low-priced, smaller cars is encouraging to this firm: "... fantastically crowded traffic conditions in America's big cities have opened a new market for small low-powered automobiles. . ." Ford's big question, price, will be met by Playboy production methods, it is hoped.

Hundreds of dealers and distributors have already been signed for Playboy franchises. Playboy is receiving attention in foreign countries, too—it is particularly adapted for European use.



1—LONGITUDINAL inside seam. Welding head or "gun" travels on carriage of flame-cutting machine



2—ADJUSTABLE ARM fastens welding gun to carriage. Control box starts or stops travel and welding

Manual "Hidden-Arc" Process

New semiautomatic welding method reduces the cost of both longitudinal and circumferential welds in glass-lined chemical reactors

BY J. S. McKEIGHAN

District Engineer, Cleveland, The Lincoln Electric Co.

At Glascote Products Inc., Cleveland, manual "hidden-arc" welding is effectively improving quality control and reducing direct labor costs in the manufacture of glass-lined tanks.

Flexibility of the manual hidden-arc equipment permits its use for making longitudinal and cicumferential welds on both the inside and outside of a closed vessel. The welds are made under a blanket of inorganic flux and cooled under slag. They are free of hydrogen (that might otherwise be released during the enameling process), and the high currents and fast travel speeds reduce welding time. Smooth welds that require little grinding for finishing are produced, and a uniform appearance is achieved. Finally, there is no weld spatter to clean.

Portable Equipment

The welding equipment that is being used at Glascote Products consists of a self-sufficient portable unit providing all the necessary welding current and auxiliary power plus the automatic feed mechanism and controls. The basic element is a standard 600-amp welding generator which can also be used for manual d-c welding. Mounted on the welder (Fig. 1) is a compact unit containing the wire reel, feed mechanism, drive motor and voltage controls. A special cable and a cone shaped welding gun complete the equipment.

Wire-Feed Method

In operation, the electrode wire is automatically fed to the work through flux deposited by gravity from the gun. The wire is fed from the reel through the special welding cable, which is of rubber-covered stranded copper with a closely wound coiled spring in the center. This cable provides a light, flexible carrier for both welding current and electrode wire.

The process uses a 5/64-in. wire to provide ease of operation in manipulating the gun. Because wire is fed through the gun nozzle at the rate of approximately 300 inches per minute (exact speed depends on the current setting) and because current is introduced to the wire close to the arc, it is possible to use 600 amp with only a 5/64-in. wire. A 3/8-in. electrode, almost five times as large in diameter, is required to handle 600 amp in regular hand welding.

High Current Densities

A constant arc voltage is automatically maintained independently of the height of the gun. The gun, therefore, can be raised or lowered to regulate the amount of flux that is needed to cover the arc completely. With the 5/64-in. wire and 600 amp, extremely high current densities are produced. The current densities of manual hidden-arc welding are the highest that have ever been used. Enough heat is concentrated to weld 3/4-in. plate in a plain butt weld, one pass on each side, without edge preparation. The smooth, deeply penetrating, spatter-free welds produced have hitherto been associated only with fully automatic welding.

Glascote is using the above equipment and process to fabricate 2,000 gallon reactors for the chemical industry. These are all-welded steel vessels. The shell of each tank is rolled out of 15/16-in. plate while the head is made of 1-in. material.

Joining tank head to shell—outside and inside seams

3—OUTSIDE SEAM joining first head to the shell. Operator sits on adjustable boom swung above the tank

4—INSIDE SEAM is made within the tank. Plank is weighted to hold the operator above the rotating shell

A glass lining is applied to the finished vessel.

After the shell has been rolled to size, its edges are prepared for welding by beveling them 30 deg, leaving a 1/4-in. land in the center. The beveled edges are cleaned by grinding. To hold the tank to its proper shape, a back-up bead is put in the longitudinal seam manually.

Use Flame-Cutting Carriage

The shell is mounted on rollers, and the track of a straight-line cutting machine is placed through it as shown in Fig. 1. The carriage of the cutting machine is adapted to this new use by means of an adjustable arm, to which is clamped the welding gun. Provision is made for both horizontal and vertical adjustment, enabling the gun to be properly located both for height and parallel travel. An excellent close-up of the welding gun and carriage is given by Fig. 2. The "inch button" for inching the electrode wire and the switch that starts both travel and welding are mounted on a control box on the carriage so that the operation can be controlled from the actual point of welding.

End tabs, also shown in Figs. 1 and 2, are tacked at the beginning and end of the seam to eliminate craters at the ends of the weld. The bead is laid in one pass without interruption. Using a current setting of 550 amp and a travel speed of 12 ipm, a 100% penetration is secured.

For the outside weld, the seam is rolled to the top and the track is mounted on the outside of the shell. The same welding procedure is followed as on the inside seam.

One head is positioned on the newly welded shell and tacked with 2-in. welds placed every two feet. The tack welds are ground flush. The fit-up of this head is critical. All places where daylight shows through are welded tight by hand in order to prevent blow-through with the hidden-arc welder. The joint is beveled 30 deg both inside and out and thoroughly cleaned by grinding before welding begins.

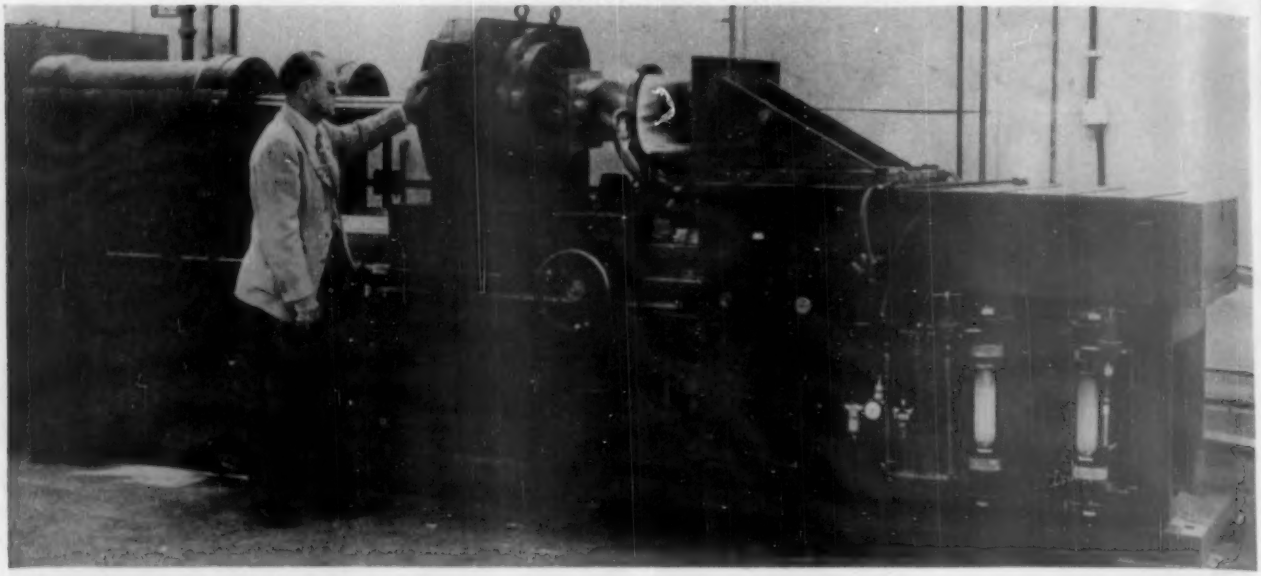
Circumferential Welds

One pass is made at a speed of 10 ipm and a current setting of 500 amp, again securing 100% penetration. An interesting feature of the outside circumferential weld is that the operator is seated on an adjustable boom swung above the joint (Fig. 3). He holds the gun directly over the seam in a semiautomatic welding operation. The arc and wire feed are started by touching the electrode wire to the shell, and the weld is made without interruption and without weaving. To stop the arc, the gun is merely lifted.

To make the inside weld joining the first head to the shell, a board is run into the tank from the open end and counterweighted to support the weldor above the inner surface. The weldor is thus kept from sharing in the tank's rotational movement. Fig 4 pictures the setup in a tank of a smaller type. This bead is made with a 550-amp setting, the increased amperage being needed to burn out any impurities in the weld. With this setting, a penetration of 100% is secured.

The second head is tacked on, and the outside pass is made as on the first head. The inside weld, however, poses a more difficult problem since the tank is now a sealed vessel except for its manhole and outlet connections. To make this final weld on the second head, the welding gun and the traveling carriage are taken inside through the manhole. The carriage holding the gun rides on the shell and is kept parallel to the seam by the operator as the tank is rolled. A level is kept on the carriage to maintain a check on its position in relation to the tank.

The varied ways in which the manual hidden-arc equipment has been applied to the manufacture of these big reactors well demonstrate the inherent flexibility of the process. This flexibility extends the advantages of automatic welding through simplified installations to applications where it previously was not considered economical nor physically possible.



1—MENASCO "UNIWELD" machine is basically a hydraulic press. Standing over 6-ft tall and weighing 15 tons, this model can weld sections with diameters up to 20 in. Welding head is shown on the opposite page

Pressure-Welded Aircraft

Menasco Mfg. Co. has brought the oxyacetylene pressure welding process to a high state of refinement for the production of tubular aircraft members

FRED M. BURT

Welded railroad rails and large-diameter piping are by no means the only application of oxyacetylene pressure welding. In the plant of Menasco Mfg. Co., Burbank, Calif., the process has been brought to probably its most advanced state of refinement and practical development for critical uses. The new techniques involved have been given the Menasco name of "Uniwelding." The research and application, past and present, is under the direction of E. R. Proctor, chief engineer, to whom the writer is indebted for the data needed to prepare this article.

Advantages for Tubing

Pressure welding is able to give the design engineer a weld which can, section for section, meet the requirements demanded of the base metal. No weld metal is added, nor is the analysis of the metal at the weld altered. Hence the weld zone responds to heat treatment identically with the base metal.

Menasco has successfully welded tubes of 15½-in. OD with a wall thickness of 1 3/8 in. and feels that even heavier sections can be welded.

Mr. Proctor points out that by the use of oxyacetylene pressure welding joints of 100% strength can be made with a *high degree of consistency*. How these 100% joints are made and the consistency is attained and maintained is our main theme.

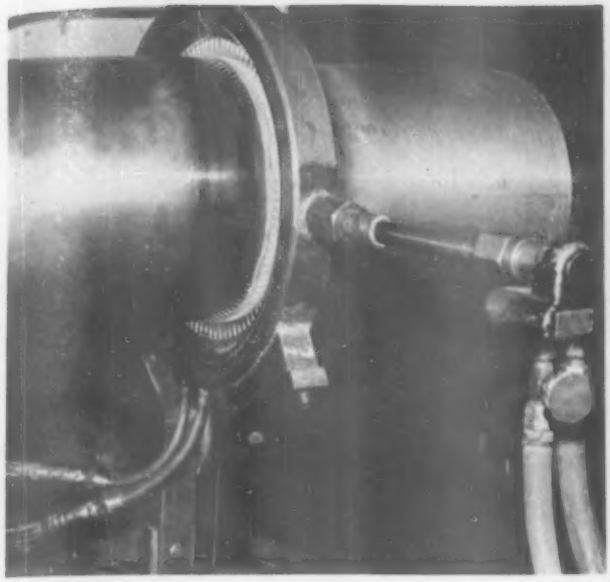
Can Use Lighter Member

Pressure welds have been made in a wide range of carbon and alloy steels, as well as some non-ferrous metals, but the work done at Menasco has been largely with medium-carbon low-alloy steels such as are used in the manufacture of aircraft landing gear and other component parts. In the manufacture of landing gear, pressure welding has proved to be highly satisfactory because of the consistently high quality of joints. Weight saving, of paramount importance in aircraft design, is also probably the most important advantage of Uniwelding.

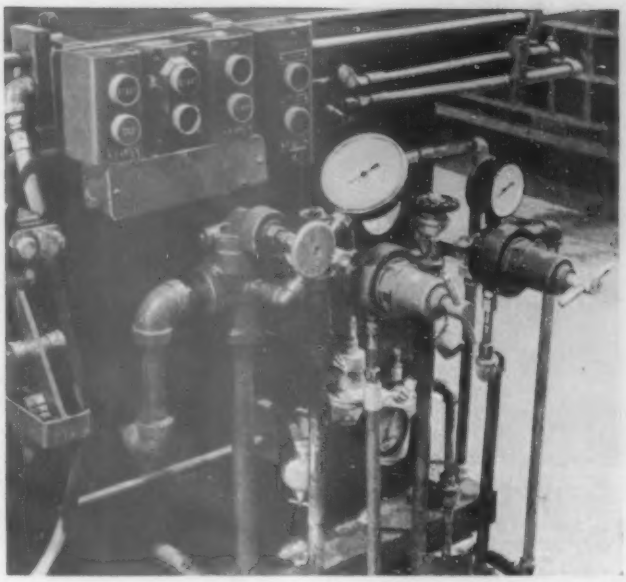
One Part: $2,000,000

A single strut manufactured by Menasco for one of tomorrow's sky giants was reduced 2,500 lb in weight by the use of Uniwelding. Let's translate that into dollars and cents. Commercial air lines estimate payload value at about $157 per pound per year. Multiply 2,500 by $157 and you get $392,500 extra earnings per year. Then multiply by five (a very short life of service for a modern plane), and the resultant $1,962,500 shows just what that one strut saved. Thus it is easy to see why Menasco has put a lot of money, time and brains in these developments. It wouldn't have been justified for any products in the manufacture and use of which the stakes were not important.

Consistent savings provided by Uniwelding average approximately 20% under the weight of designs



2—BURNER RING is fed by oxygen and acetylene from the right; the two hoses below are water connections



3—PUSHBUTTONS regulate movement of hydraulic ram, welding head oscillation and flame shut-off valve

based upon assembly by bolts, nuts, rivets, etc

Pressure welding is accomplished by butting together under pressure two machined faces of parts to be welded, at the same time heating the area of the weld plane until sufficient upsetting takes place. The essentials are intimate contact of surfaces to be welded, proper heat and pressure, exclusion of air or any material that might cause physical or chemical discontinuity between the abutting weld faces. Bonding is due to the atomic attraction effected by intimate contact of the weld surfaces, obtained by hot working or upsetting. Hot working also serves to break down inhibiting films on the weld faces

Press and Welding Head

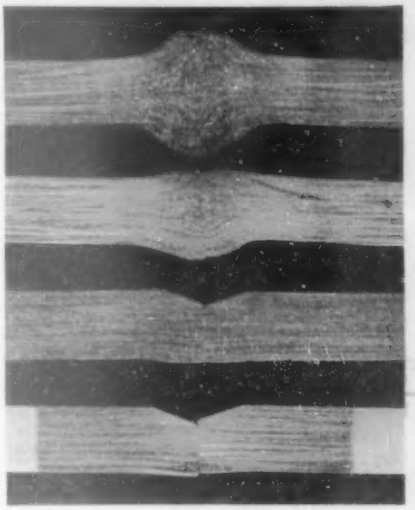
The Uniwelding equipment (Fig. 1) consists fundamentally of a hydraulic press of the proper capacity for the size of the material to be welded. It is equipped with fixtures for holding parts in proper alignment. The movable carriage or pressure plate at the left of the picture is axially loaded by two hydraulic pistons moving in a plane through its centerline. Such axial loading minimizes angularity and misalignment of component parts.

The press has an oxyacetylene heating head and a device to measure and control the amount of gather or travel of the hydraulic ram. This gather must be sufficient in amount to form upsets which are high enough to permit the machining away of any fissure that might appear in the internal upset as well as the small amount of oxidized metal that forms on the external upset.

Bonding without Belling

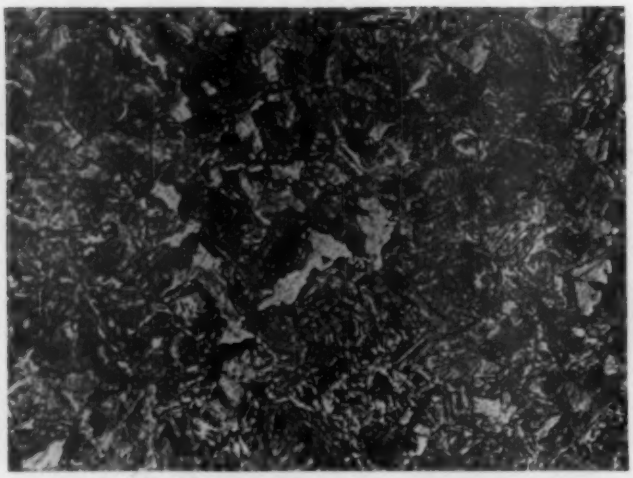
Heat and pressure are regulated independently of each other. It is necessary, however, to secure a proper heat-pressure balance so as to permit good bonding without "belling" (bulging outward of the tube) in the region of the weld. The belling tendency of a weld increases as the wall thickness of the tube decreases and also as the diameter-to-wall-thickness ratio increases. Belling is held to a minimum by the use of a high rate of heat input with a pressure high enough to effect upsetting before excessive melting takes place on the outside diameter of the tubes.

The principal requirement of the heating head (Fig. 2) is that it produce a high temperature throughout the weld interface at a rate suited to the particular work being welded The linear heat gradient, both axially and radially, must be considered so that the weld faces do not open up because of differential thermal expansion. The heating



4—PROGRESS of weld in ¼-in.-walled tubing is shown from bottom to top. Average time to make the weld is about two minutes

5—BEND-TEST specimen has ruptured—but outside the weld area



6—PUZZLE is to find welding area in this cross-section taken through the center of a Uniweld (249X)

7—BORING TOOL of special design is used to cut a chip from the internal upset for etched inspection

Photomicrographs indicate weld structure is same as that of parent metal

head is oscillated laterally or circumferentially in order to distribute the flame from each orifice over an appropriate area; this not only transfers heat efficiently but also prevents overheating of the metal immediately beneath the flame tip. The head shown has jets equally spaced and drilled radially and was designed especially for welding of tubing.

Other accessory equipment consists of flowmeters for the control of oxygen and acetylene, a pressure regulator for the hydraulic system and electrical means for controlling the amount of gather. The control mechanism is depicted in Fig. 3.

Welding Procedure

In applying the process, the ends to be welded are machined to smooth, clean surfaces. The opposing pieces are carefully aligned and then the pressure is applied. The torch or heating head is lighted and adjusted to predetermined gas pressures and flows. After the metal has reached approximate welding temperature, it starts to upset gradually. As the process continues the temperature gradually increases while a predetermined degree of upset is produced. The flames are then extinguished, and the end pressure is relieved by means of a micro switch. Parts may be removed immediately for cooling, and a new welding job started. Welding time ranges from a few seconds to several minutes, depending on the wall thickness of the weldment. The average time for ¼-in.-walled tubing is about two minutes. Cross-sections showing the progress of a weld in such material are shown in Fig. 4.

Human shortcomings are not a factor since one setting of the Uniweld machine establishes the guide for the production run. All welds are identical in strength, appearance, quality and speed accomplishment.

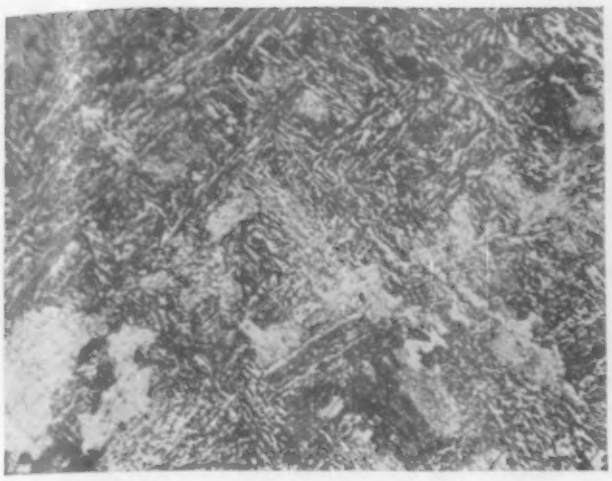
Method of Control

The time consumed by the welding operation, the rate of temperature rise, the total gas flow, and the degree of upset are all variables in the Uniweld operation. Their values might be measured and used as means for determining the progress of the weld except that they are partially nullified by the entry of non-measurable variables. A draft of cool air, for example, may affect the time needed to raise the metal to the required temperature. Thus it is not possible to use either total gas consumptiion or elapsed time as the means of control. Neither is temperature measurement a reliable and consistent method of determining the progress of the weld. However, the degree of shortening of the parts (amount of upset at the joint) has proved an excellent medium of measurement under conditions of predetermined constant pressure and rate of heat input This has also proved an entirely satisfactory method of control since it is a relatively simple matter to control the amount of gather electrically.

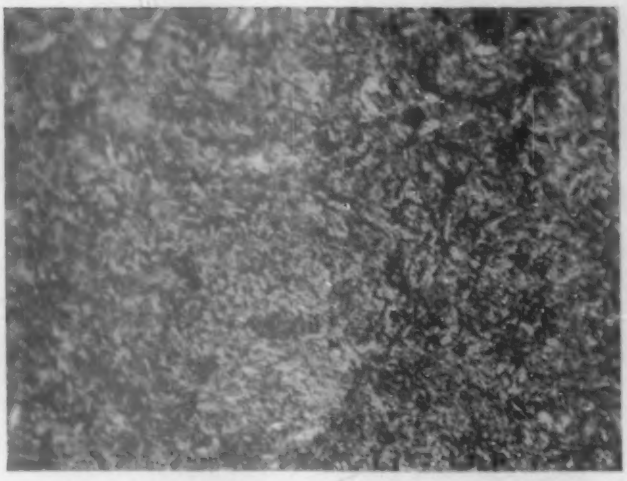
Acceleration of welding production is inevitable. A test run of 100 welds was accomplished in 6½ hours, an average of a weld every 3½ minutes. Compare this with the average 15-minute-per-weld of conventional arc welding.

Most foundries have inadequate facilities for handling the large forgings demanded by the huge transport planes of tomorrow, and are not anxious to handle such projects in the first place because of the great scrap loss should a single piece be found defective. Uniwelding is the ideal solution for this difficulty since it allows the use of a number of relatively small components which may be produced with little financial risk, handled easily and assembled into the form of the finished part without loss of strength or other desirable features.

Special machinery suitable for Uniwelding the largest stock sizes now in use in the aircraft industry has been designed and put into operation at Menasco. The first experimental welds were made on the base of a hydraulic press formerly used to "run in" landing-gear struts. The original set-up was operated by three men, one controlling the hydraulic system, one applyig the flame, the third watching the progress of the weld and signaling when it had progressed sufficiently. This primitive system gradually evolved into an automatic process in which an



8—AS-WELDED condition. Note large size of grain structure revealed by this photomicrograph of a weld



9—AFTER NORMALIZING, hardening and drawing, the weld of Fig. 8 shows complete grain recovery

electric switch cuts off the flames and hydraulic pressure when the hydraulic ram has moved a certain distance. The distance was established by trial and error, test and more trial.

In many Uniwelded tubes tested to destruction, the welds revealed greater strength than the required strength of the parent metal (see Fig. 5). Study of microphotographs of cuts through welding planes fails to reveal any separation between the parts or any evidence of flaws or imperfections. The metal grain structure of the weld cannot be distinguished from the structure of the parent metal (Fig. 6). The strength of the weld, consequently, must be equal to the strength of the metal.

Cutting out Test Samples

Metallurgical samples are welded and examined from every size of pressure weld that is made at Menasco. A special tool (Fig 7) is used to cut a chip from the internal upset in a tightly curled form This coiled chip from one half the internal upset is cut through the center at the weld plane and polished for examination. It is then etched with an alkaline chromate solution for the detection of oxygen concentration in steel (developed by the Menasco laboratory and patented). After the etching, the sample is examined for both fissure and oxygen concentration. If the quality of the weld sample from this innermost section is O.K., there can be no doubt as to the quality of the remainder because the weld progresses from the outside of the tube inwards. A chip with a white zone will indicate a poor weld which should be rejected. A chip without any white zone indicates a weld that will pass any of the tests to which it might be submitted.

Fundamentally, bonding in pressure welding is the cohesion of two metallic faces by atomic attraction. Theoretically, if two identical pieces of material of random grain orientation could be so faced that variations from a geometric plane were of the order of normal atomic spacings (and if no contaminants were present when such faces were touched together) they should adhere with a bond comparable with the intergranular bond in any other section of the same material. Pressure, heat, recrystallization and diffusion phenomena play no part in the theoretical concept of bonding Under actual welding conditions, however, they are valuable aids in bringing about at the weld plane the basic requirements of intimate contact and freedom from contaminants.

Pressure applied to parts during welding induces mechanical upsetting in the general area of the weld. The results of this deformation consist of the reduction of the size of voids present, the spreading of the voids apart and the rupturing of the oxide film when it is too heavy to dissolve before deformation takes place. Pressure also acts to seal out air and solids from the weld faces.

Heating of the weld plane during welding has a two-fold effect. First it increases the plasticity of the material, thus facilitating deformation due to surface energy forces and to mechanical upsetting. Secondly, molecular activity is increased by heating, thus increasing the rate of diffusion of contaminants.

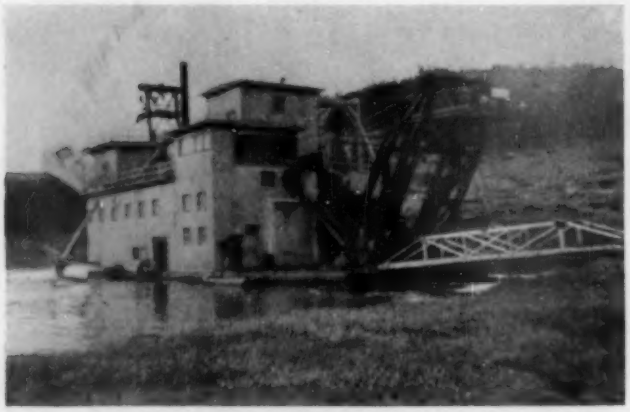
In the as-welded condition, grain size in the weld cross-section is relatively large (Fig. 8). Normalizing, hardening and then drawing bring a complete grain recovery (Fig. 9).

In aircraft landing-gear design, a prime consideration is a high strength-to-weight ratio. Steels generally used for the highly stressed members are the SAE 4100 and 4300 series or equivalent substitutes which possess good ductility when heat treated to the 190,000-200,000 psi tensile range. The principal stresses involved are bending, axial tension, axial compression and torsion.

Bend Test Duplicates Service

To determine the quality of pressure welds for landing gear, Menasco has adopted a static bend test on heat-treated sections after the weld upsets have been removed. Bend testing simulates one of the major stresses applied on a gear in service and has also been demonstrated to be a more severe test than tension tests on coupons cut from the weld. Tensile tests in the usual laboratory physical testing machine are limited to rather small cross-sections, whereas very heavy sections can be tested in bending merely by making the sections long enough

Continued research is aimed at realization of every possible potentiality for aircraft that might lie in any phase of pressure welding.



1—DIGGING FOR GOLD! Massive dredge weighs about 3,500 tons and costs around a million dollars

2—BUCKET LINE ascending. Eyes of the buckets elongate and lips wear down 1-1½ in. in ten days

Gold Dredge Kept Digging

BY H. B. McGUIRE

Dredge Superintendent, Tuolumne Gold Dredging Co., LaGrange, Calif.

A bucket line of a hundred or so cast manganese-steel buckets, each weighing 2½ tons, poses no easy maintenance problem. How worn buckets and the big upper driving tumbler were restored to proper dimensions is told here

Gold dredges of the continuous bucket type, look from a distance like enormous floating houses. One of these dredges (Fig. 1) weighs 3,500 tons and costs about a million dollars. They operate in old glacier beds along lakes and rivers recovering the deposits of precious gold that were left there millions of years ago by retreating glaciers. Their massive buckets are capable of digging for gold through mud and gravel to depths of 125 ft or more.

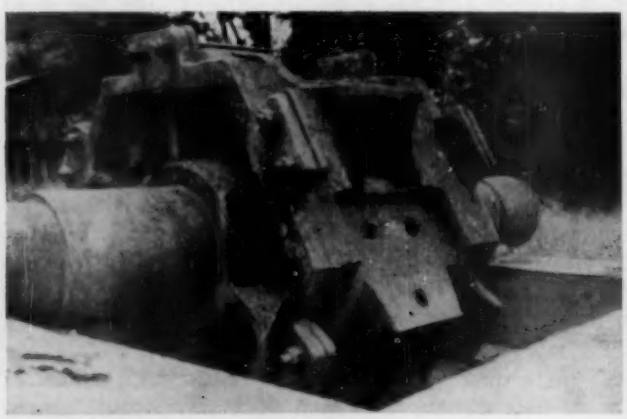
Heart of the dredge is, of course, its continuous bucket line. The dredge shown in the picture has 101 buckets, each holding ½ to ¾ cu yd of gold-bearing gravel. Each bucket weighs about 2½ tons (including lip and connecting pins), bringing the total weight of bucket line, boom and bearings to well over 800 tons.

In Fig. 2 we see an ascending bucket line, and in Fig. 3 the underside of the same bucket line returning to the lower or idling tumbler after dumping its load of paydirt-rich gravel. So hard is the wear and tear of the gravel upon these big buckets that the cast manganese-steel lips wear down about 1 to 1½ in. within ten days. Another big problem in dredge maintenance is that of keeping the driving tumbler in or close to the same pitch as the digging buckets.

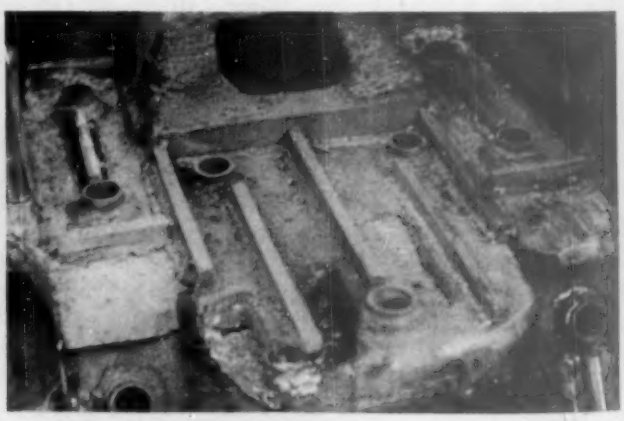
Forces Acting on Buckets

The magnitude of the latter problem will be better appreciated after a short description of the driving mechanism. The bucket line and up-

Photos courtesy Resisto-Loy Co., Grand Rapids



5—UPPER TUMBLER weighs 120 tons. Strike plate has been removed from the face nearest to the ground



6—HORIZONTAL VIEW of tumbler face. Tubes and filler bars serve as guides to the amount of deposit

3—UNDERSIDE of bucket line. These buckets have dumped their loads and are returning to lower tumbler

4—BUILDING UP a bucket base. Spare buckets permit this work to be done without interrupting production

per tumbler are actually no more than a specialized chain and sprocket. A 12-cu-ft dredge digging 75 ft below water has a line of around 100 buckets, weighing, with their connecting pins, approximately 2½ tons each. To the weight of the empty buckets, add the weight of material torn from its place of deposit and carried upward. The force needed to lift this great load is developed from an electric motor of 350 to 400 hp. Turning at 720 rpm, the motor is geared down to turn the tumbler at 4 rpm. The force transmitted from tumbler plate to bucket base elongates the eyes of the buckets and materially lengthens their pitch. The constant wear at the bases of the buckets works toward the same end. Conversely, the constant impact and ever-increasing slide of the buckets because of their eye elongation and worn bases tends to decrease the pitch of the tumbler, thus aggravating existing differences. The discrepancy is taken care of temporarily by installing thicker wear plates on the tumbler. Finally, however, the point is reached where the thickness of the wear plate required makes new plates impracticable. If the dredge is operated under such conditions, the continued wear and elongation of the buckets will cause failures that eventually necessitate the purchase of a new bucket line.

Possible Solutions

The easiest solution, of course, is to buy new buckets. But the buckets are manganese-steel castings and would cost in the neighborhood of $70,000 to replace. There must be a cheaper method than this.

Can we buy and install a new upper tumbler? Well, this is the normal solution, but it means an investment of $8,000 to $10,000 plus the loss of production while the new driving gear is being installed.

Is there any way in which to keep tumbler and buckets close to the same pitch? Most dredgemen have at some time or another tried cushion plates under the wear plates on the upper tumbler with little or no success. They have been persistently drilled in avoiding welding on manganese steel.

There are some reasons for this attitude. Building up of the tumbler to change its diameter by 3 or 4 inches by welding on plates is impracticable because of the impact of the buckets on the six faces of the tumbler.

Build-up by Welding

Building up the tumbler by a weld deposit some 2 in. thick and requiring some 1,600 to 1,700 lb of filler material appears at first unthinkable, from the standpoints of both cost and loss of production. Nevertheless, the job can be done by using a filler material of hard, tough nature which will fuse properly with

7—BUILD-UP completed, the tumbler face is now ready for its final finishing pass. Compare with Fig. 6

8—FINISHED TUMBLER face with wear or strike plate restored to one section. The total cost was $1,120

Table I. Costs and Materials Used

Tumbler				
Materials:	100 lb of stainless electrodes		$ 50.00	
	875 lb of ⅜-in. filler rod		525.00	
	925 lb of ¼-in. E-7010 electrodes		111.00	
	Tubing		5.00	
	Filler bars		69.00	
				$ 760.00
Labor:	Layout and preparation 48 man-hours		$ 96.00	
	Welding 176 man-hours		264.00	
				$ 360.00
Total cost:				$1,120.00
Each bucket (bases only)				
Materials:	Stainless electrodes	10 lb	$ 5.00	
	Other electrodes	40 lb	4.80	
	Filler bars	50 lb	29.00	
				$ 38.80
Labor:	Welding 10 hours			20.00
Total cost:				$ 58.80

the parent metal of the tumbler. The material must be sufficiently low in cohesive strength to permit fast deposition in layers in excess of 2 in. thick, and the speed of deposition must be such as to provide a minimum of lost operating time. Such a material is available, and it was estimated that the actual tumbler build-up could be done in 4½ days by using six men, two men per shift, three shifts per day. On this particular dredge, the main drive machinery, upper tumbler and overhead crane arrangements are such that the upper tumbler could not be changed in less than 10 or 12 days, even had a spare tumbler been available.

Using the same material, it was estimated that the base of a bucket could be built up in from 8 to 10 hours, requiring from 90 to 100 lb of filler material. Restoration of elongated eyes to round and the reseating of bushings and straps to secure added strength around the back eyes were not unsurmountable barriers (Fig. 4). It was estimated that these buckets could be completely rebuilt, with no danger of eye failure, for 25% of the cost of new buckets.

Actual desired pitch of the tumbler was determined from a full-size layout of buckets. A jig was constructed which, when placed on a machined surface on the tumbler shaft, indicated the desired height of the tumbler plate. When properly leveled, it insured correct indexing of the section in its proper tangential position.

With the first section leveled and the jig in position, measurements were taken for the amount of build-up required. A gauge was installed that made use of the 150 cut teeth on the 16-ft-diameter bull gear on the tumbler shaft. By turning the gear 25 teeth to the gauge within 1/32 in., the 4-ft diameter tumbler would be indexed much more closely than it could be built up.

Bucket line was removed from the upper tumbler (Fig. 5). The tumbler was leveled to the gauge, and the gear indexed. Measurements to bring each section to proper height and tangential position were taken over each of the 71 ¾-in. bolt holes that had been drilled to hold wear plates. Tubes were then cut and machined to proper lengths (varying from 1½ to 2 7/8 in. long). These tubes were welded solidly to the tumbler as shown in Fig. 6 to serve as guides to the thickness of build-up in each section. Filler bars, also shown in Fig. 6, were cut to the required height and aligned by means of a straightedge held on the tubes. Strips of thin material were then welded around all edges to the shape of the overlying wear plate.

Two-Tone Welding

Tubes, filler bars and strips were welded solidly in place with stainless-steel electrodes. A total of 48 man-hours were needed to do this work.

Build-up material was deposited by two men per shift working simultaneously upon one section at a time. They used the "Two-Tone" process, employing ¼-in. high-tensile electrodes and 3/8-in. special cast-manganese filler rods. In this process, the filler bar is held in close proximity to the tilted live electrode and kept in unison with it as the weldor weaves the live electrode from side to side to produce a wide, flat bead. With a little experience, very fast and quite smooth deposits can be made, and penetration and adhesiveness are generally excellent.

Judicious alternation of sections eliminated the need for preheating. Approximately eight heavy passes and one light transverse finish pass were required, consuming a total of nearly 1,700 lb of electrodes and filler rods. No grinding was necessary. On a three-shift basis, with two men per shift, the 176 man-hours required represents only 3¾ days elapsed time. Except for the final smoothing pass, the filler material was deposited at a rate very close to 10 lb per man per hour. The use of the filler rod required a 30 to 40% increase in amperage over the normal setting for welding with a ¼-in. electrode, reverse polarity.

Fig. 7 shows the tumbler ready for its final finish pass. To gauge the extent of the build-up, this illustration should be compared with Fig. 6. The finished tumbler with wear plates installed on one section appears in Fig. 8.

Bucket Renovation

Specifications called for the buckets to be set up level in the shop with their bases upward (Fig. 4). Manganese filler bars were set over the back eyes to bring the bases back to their normal plane. All cracks were to be removed by grinding or

(*Continued on page 64*)

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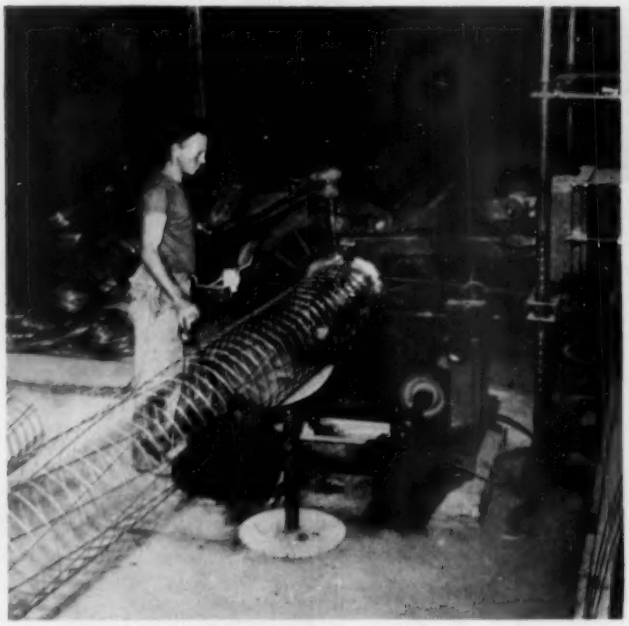
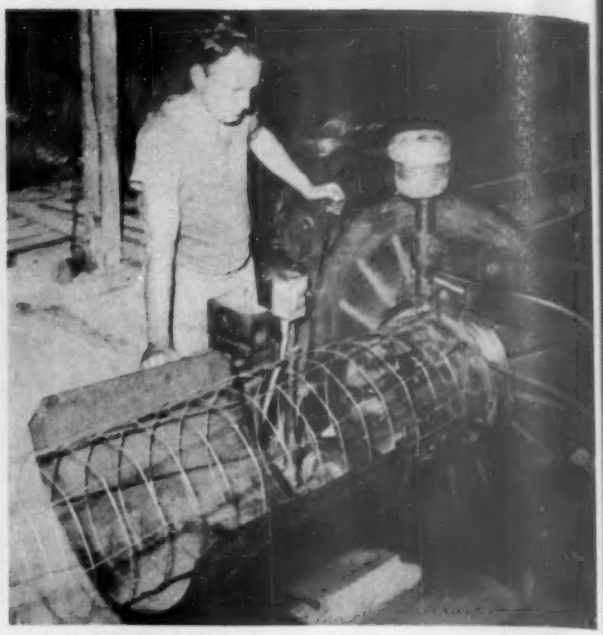


LONGITUDINAL RODS are fed through tubes running through slots in machine's three large steel disks



WELDING HEAD is attached to last disk. Electrode is weighted by lead to secure proper welding pressure

Cages for Concrete

An ingenious Australian welding machine helps make possible the construction of ferroconcrete pipe of high bursting strength to use in aqueducts

By **HERBERT LEOPOLD**
McGraw-Hill World News

Welded steel pipe lines laid above ground have helped to bring life-giving water to several arid districts in Australia.* Unfortunately, steel pipe is in short supply and relatively expensive. The shortage of steel has led to a search for concrete pressure pipes that would combine high bursting strength with an economically thin shell section.

Hydraulic prestressing of concrete pipes has lately been applied with telling effect on the bursting strength of pipes. To take full advantage of prestressing techniques and reduce wall sections and pipe weight, a welded reinforcement of extraordinary rigidity has been developed by Rocla Limited, Melbourne, Australia. The new reinforcement also has useful applications in pile and column construction.

*See "Welded Pipe Line Down Under," page 44, THE WELDING ENGINEER, Dec., 1947.

A Helical Cage

The conventional ferrous reinforcement for cylindrical concrete structures consists of rods or wires running in both longitudinal and circumferential directions and tied or welded together by hand at the intersections. Instead of this, Rocla produces a rigidly welded cagelike cylinder, formed by wrapping a wire helically around six to twelve longitudinal rods and welding the wire to the rods at each intersection.

The cage is fabricated both quickly and cheaply on a specially designed resistance welder. The outstanding feature of this machine is that the helical winding of the circumferential wire also provides the means of propelling the cage from the welding position and of drawing unwelded longitudinal rods past the welding head. Only one operator is required.

The body of the machine consists of three large steel disks about 2 ft 6 in. in diameter and spaced several feet apart. These rotate on trunnion wheels and are driven by a common shaft with variable-speed drive. Each disk has radial slots to accommodate up to twelve tubular members, which can be positioned in the slots to fit a range of cage diameters. The longitudinal rods, usually consisting of cold-drawn wire, prestraightened and cut to length, are drawn through the tubes.

The welding operation takes place on a brass welding head, a back-up band of the same diameter as the cage, which is attached to the last of the three slotted disks. Rotation of the welding head wraps the spiral-forming wire, coming off a coil, around the forwardly traveling longitudinal rods. The wire is automatically welded to the rods as it forms intersections with them.

AS CAGE EMERGES, rotation of welding head pulls the unwelded longitudinal rods forward and wraps the wire around them in the required helix

Reinforcement

Attached to the machine frame independently of the welding head are one or more guide arms that carry adjustably inclined guides. Varying the inclination of these guides enables the pitch of the circumferential spiral to be set as desired. By bearing against the welded helical wire, the guides cause it to move forward and also to draw the longitudinal rods through the disk slots, ready for welding the next turn.

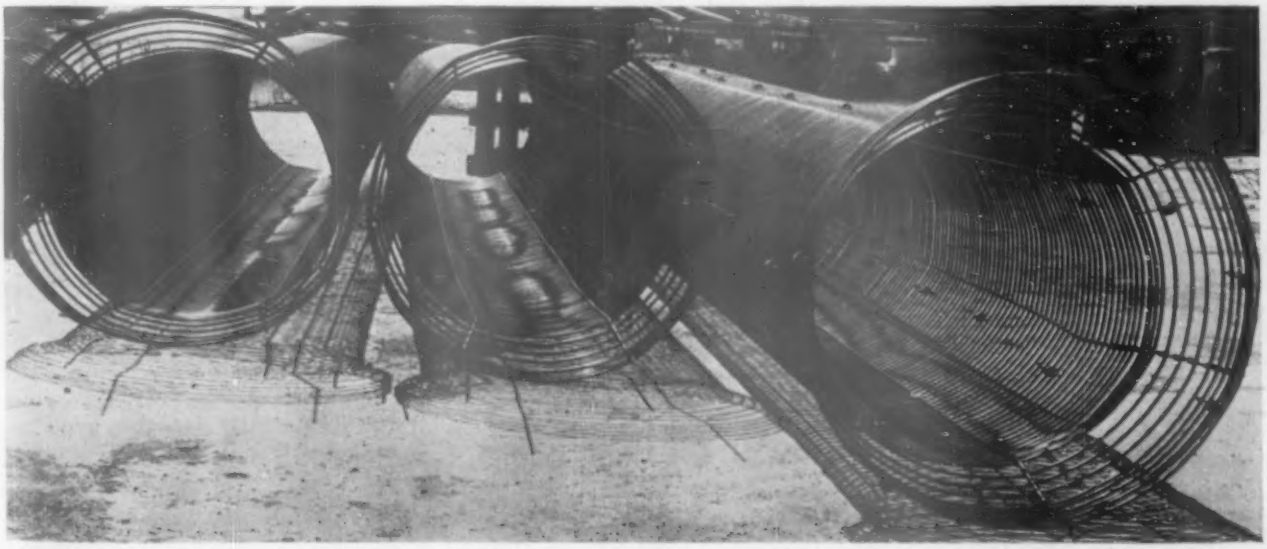
How It Welds

According to whether one or more guides are used, the longitudinals appear in the cage either straight or in a long helix that intersects the spiral wire at more nearly right angles than the straight rods.

The welding operation itself appears to be an ingenious combination of spot and seam welding. A copper arm is brought from one pole of the welding transformer to bear on the brass welding head by means of a brush. An arm from the other pole of the transformer holds an electrode that bears slidably on the spiral wire and is weighted by a heavy lump of lead to give the required welding pressure. The current flows through each intersection to make the weld and then through the back-up band and brush to the first-mentioned arm and back to the transformer. Between intersections, the current is cut off by means of a control cabinet with an automatic switch. Some 200 intersections a minute are welded, representing up to 5 ft of cage length, depending on the pitch of the spiral. The quality of the welds is excellent; in fact, in excess of requirements.

The machine handles longitudinal rods of 0.104-in. to 0.25-in. diameters and spiral wires of up to 0.28-in diameter. A 35-kva transformer is used, connected to a 400-volt supply. For the lighter wires, a 15-kva transformer has been found adequate. In Australia, light cages of this type have found a ready market as tree guards.

Reinforcements of the socket sections of pipes, when required, can be produced integral with the main body of the cage on a special machine over a collapsible arbor. These were made by making larger diameter cages, cutting off a socket length and attaching by wire ties.



COMPLETED CAGES are ready for the casting molds to make sections of ferroconcrete pipe line to convey water

NWSA Meeting

Two-day meeting of welding distributors and manufacturers in St. Louis was highlighted by 19 technical presentations

BY T. B. JEFFERSON

FOURTH annual convention of the National Welding Supply Association was termed a huge success by all in attendance. Nearly 200 welding supply distributors and equipment manufacturers from all sections of the United States met to discuss their mutual problems at the Sheraton Hotel, St. Louis, May 19 to 21. Along with the meeting went a trade show, at which some twenty manufacturers displayed their wares when technical sessions were not in progress.

OPENING ACTIVITIES

Activities of the opening day, May 19, were confined to the registration of members and guests and to a dinner meeting of the NWSA executive committee and board of trustees.

On May 20, President Ralph E. Chase, Chase Welding Supply Co., Inc., Benton, Ill., welcomed the members at the opening session and gave the annual address of the president.

Secretary-Treasurer Robert C. Fernley read the treasurer's report, revealing that the association is solvent and has been paying its way. In outlining the activities of the association during the past year, Mr. Fernley reminded the members of their successful zone meetings at Grand Rapids, Omaha and New York. He urged members to take advantage of their association's facilities, including the secretary's office, the collection bureau, surplus stock bulletins and current reports. The latter contain valuable data on the Taft-Hartley law, wage and hour law, insurance coverage, etc.

MEMBERSHIP GAINS 177%

Glenn G. Garman, Purity Cylinder Gases, Inc., Grand Rapids, reported as chairman of the membership committee that during the past year the membership of the association has grown from 43 members to 119. Of this number, 82 are active members and 37 are associate. Of the six regional zones, the central zone has the largest membership, 47 members; the eastern zone is next with 34 members.

The remainder of the morning session was turned over to technical papers. The first, entitled "Aspects of Electric Welding," was by C. H. Turnock, Westinghouse Electric Corp. Mr. Turnock cautioned the distributors and manufacturers to remember "that your customers are voters who each day go to the polls (the welding supply house) to vote for or against your product." H. B. Gilson, The Linde Air Products Co., in his paper, "New Developments in Oxyacetylene Welding," reviewed the history of oxyacetylene welding from its inception.

The sessions Thursday afternoon were divided so that distributors and manufacturers could meet seperately and discuss their respective problems. The distributors' meeting, under the chairmanship of James N. Alcock, Saginaw Welding Supply Co., got under way with a few opening remarks by the chairman and by Secretary R. C. Fernley. These remarks were followed by four technical papers:

"The Importance of Knowing How Your Expenses Compare with Others in the Industry" by Glenn G. Garman, Purity Cylinder Gases, Inc.

"Our Experience in: (a) Laying out the most efficient route coverage. (b) The number of calls per account per month. (c) The territory covered per route," by Ray W. Metzger, Compressed Gases of Ohio, Inc., Cleveland.

"Office Records of Cylinders and Other Equipment Which Has Proved Practical" by R. S. McCracken, Jr., R. S. McCracken & Sons, Inc., Philadelphia.

"Are Truck Driver Salesmen the Most Effective Means of Covering your Territory?" by James C. Dawes, James C. Dawes Co., Martins Ferry, O.

RALPH E. CHASE, Benton, Ill., was re-elected president of the National Welding Supply Ass'n.

The simultaneous manufacturers' meeting, under the temporary chairmanship of Clayton B. Herrick, editor, *Industry and Welding*, discussed such subjects as:

How can the manufacturer better assist the distributor to increase his sales; future outlook for welding supplies and equipment; trade show of the association; the importance of openly announced sales policies; new developments in welding.

SECOND-DAY SESSIONS

At the morning meeting on May 21, J. G. Magrath, executive secretary of the American Welding Society, talked about the purposes and objectives of AWS. "The Welding Industry As Seen from the Trade Press" was the subject given to Irving B. Hexter, publisher of *Industry and Welding*. F. P. Kohlbry, Machinery and Welder Corp., discussed the distributor's responsibility to the manufacturer, and H. J. Howey, of Miller Electric Mfg. Co. and Sight Feed Generator Co., took the counter topic of the manufacturer's responsibility to the distributor.

Friday afternoon sessions, reverting strictly to the problems of the distributor, resulted in five papers:

"New Lines which We Believe the Distributor Can Handle Profitably" by A. T. Henry, Henry's Welding Supplies, Sedalia, Mo.

"Should the Distributor Be in a Position to Service Users of All Types

of Welding Equipment and Supplies?" by R. J. Koltes, Red Arrow Sales Corp., Madison, Wis.

"Can the Small-Order Problem be Minimized by the Manufacturer and by the Distributor?" by R. L.Townsend, Tweco Products Co., Witchita, Kan.

"How We Endeavor to Keep Our Stock in Balance" by E. C. Caluwaert, manager, O. K. I. Welding Supply Co., Cincinnati, O.

"What Can Manufacturers and Distributors Do to Better Acquaint the Distributor's Salesmen With Their Products, New Processes, Etc.?" by R. S. Mars, president, W. P. & R. S. Mars Co., Duluth, Minn.

Annual Dinner

Social activities were confined to a reception and to the annual dinner on Thursday evening. At the latter event, President Chase acted as toastmaster, and Major James E. Brown, Employers Mutual Liability Insurance Co., delivered an address on "Communism As It Confronts Americans Today."

President Chase and Senior Vice-President R. S. Mars were re-elected to their respective offices. Five new vice-presidents were elected: Howard Proctor, Acme Welding Supply Co., Houston, Texas; W. C. Starcher, Willard C. Starcher, Spencer, West Va.; J. W. Albiston, Maine Oxy-acetylene Supply Co., Auburn, Me.; J. N. Alcock, Saginaw Welding Supply Co., Saginaw, Mich.; Hal Savage, Phoenix, Ariz.

Executive committee members are:

W. R. Boyd, chairman, Boyd Welding Co., Erie, Pa.; V. S. Rice, Virginia Welding Co., Charleston, West Va.; George Sommerfeld, Sommerfeld Welding Supply Co., Oshkosh, Wis.; R. B. Tarbell, Scott-Tarbell, Inc., Cleveland; Everett Johnson, Welders Supply Co., Inc., Boston; G. P. Modlish, Jennings, La.; Everett P. Lutz, Anderson Equipment Co., Los Angeles.

New members of the board of trustees, whose terms will expire in 1951, are: Glenn G. Garman, Purity Cylinder Gases, Inc., Grand Rapids, Mich.; W. R. Boyd, Boyd Welding Co., Erie, Pa.; F. P. Kohlbry, Machinery & Welder Corp., St. Louis; R. C. Waldie, Williams & Co., Inc. Pittsburgh: and Hal Savage, Arizona Welding Equipment Co., Phoenix.

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GUESTS OF HONOR and IAA dignitaries. Left to right: G. O. Carter, The Linde Air Products Co.; Albert McMillan, Shawinigan Chemicals Ltd.; Hon. D. Roland Michener, provincial secretary of Ontario; Hon. Eugene I. Van Antwerp, mayor of Detroit; Robert B. Swope, retiring IAA president

MOREHEAD MEDAL for 1947 was presented by Mr. Carter to Mr. McMillan for his pioneer work in installation of acetylene generators

1948 IAA Meeting

In a crowded two days, the International Acetylene Association celebrated 50th anniversary with smartly programmed convention

BY CLYDE B. CLASON

A HALF CENTURY old next August, the International Acetylene Association can be said to have attained full maturity insofar as conventions are concerned. The 1948 annual meeting in Detroit ran smoothly as a precision cutting torch from the luncheon ceremonies at the Book-Cadillac on May 3 to the last of the technical papers on the following day. Some 225 visitors were registered.

VERY IMPORTANT PERSONS

Detroit being just north (no misprint) of the border from Canada, it was fitting that the feature address of the opening luncheon should be delivered by a Canadian. A fluent and entertaining speaker, the Honorable D. Roland Michener, provincial secretary of Ontario, brought the greetings of his province to "this long established association." Canada, the Honorable Michener revealed, is acutely conscious of foreign and domestic policies of the United States, for, as he expressed it, "When a small man and a large share the same bed, it's not the large man who has to worry over changes in position."

Another distinguished visitor was the Honorable Eugene I. Van Antwerp, mayor of Detroit, who offered the friendship of his city to the IAA delegates.

An excellent address was made by the association's retiring president, Robert B. Swope, Southern Oxygen Co., Washington, D. C. Mr. Swope pleaded for better teamwork between the threefold partnership of government, business and labor. Education, he asserted, is one answer to the misstatements of demagogues. A hopeful path for the future, Mr. Swope believes, lies in profit-sharing and stock ownership plans to develop employee interest in the success of a business.

Climax of the luncheon program was, of course, the presentation of the 22nd James Turner Morehead Medal to Albert McMillan, Shawinigan Chemicals Ltd., Montreal, for "consistent and always productive work in the installation and operation of acetylene generation plants." The presentation was made by Glenn O. Carter, The Linde Air Products Co., New York City, a former IAA president.

Mr. McMillan entered the acetylene industry on September 1, 1912, at the Shawinigan plant. Early in World War I, acetone, an important ingredient of explosives, was in short supply, and McMillan was given the job of working out the seemingly insurmountable problems concerned with the engineering operating, design and construction of acetylene generating equipment. He succeeded.

In his speech of acceptance, Mr. McMillan declared:

"That original generation of 50 tons of calcium carbide per day into acetylene has been doubled many times over, and the end is far from in sight. Our acetylene industry has a future that can scarcely be comprehended."

LINCOLN NEW PRESIDENT

John J. Lincoln, Jr., director of sales services for Air Reduction Sales Co., New York, was elected IAA president at the business meeting held at the close of the first day. Mr. Lincoln had served as vice-president and member of the executive committee for the 1947-48 term.

A. J. Fausek, president, Modern Engineering Co., St. Louis, was elected vice-president, and E. V.

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David, assistant manager of the Airco technical sales division, New York City, was elected treasurer. H. F. Reinhard, The Linde Air Products Co., was re-elected secretary.

R. B. Swope, retiring president, was elected a director of the association for a three-year term. Henry Booth, Shawinigan Products Corp., New York City, and C. McL. Pitts, The People's Gas Supply Co., Ltd., Ottawa, Canada, were re-elected directors for three-year terms.

Other business transacted included the report of the secretary, H. F. Reinhard, the report of the consulting engineer, J. I. Banash, and the report of the Oxyacetylene Committee by its chairman A. N. Kugler. Secretary Reinhard also presented the treasurer's report since the retiring treasurer, Philip Kearny, was unable to attend the meeting. It was gratifying to learn that the treasury has a healthy surplus.

Possible convention cities of the future were discussed at this meeting. Most likely candidates for 1949 are San Francisco, Boston and Pittsburgh, with a strong probability that the 1950 convention will be held in a Canadian city.

Technical Sessions

Eleven technical papers were presented in three sessions occupying one morning and two afternoons. This heavy program could hardly have been carried through on schedule without the behind-the-scenes labors of session chairmen and co-chairmen, all of whom are to be commended for successful timing and stimulating discussions.

Without exception the technical papers were excellent. There wasn't a lemon in the lot.

The first afternoon's session, held at the Book-Cadillac, was under the able direction of Adelbert C. Good, associate professor of engineering shop, Wayne University, and C. McL. Pitts, The People's Gas Supply Co. Ltd., Ottawa, serving as co-chairmen. Papers were presented by Clayton B. Herrick, editor, *Industry and Welding;* Ward W. Swarthout, process engineer, Acme Industries, Inc., Jackson, Mich., and V. Orange, superintendent of maintenance, Atlas Steels, Ltd., Welland, Ont.

Mr. Herrick's paper dealt with

J. J. LINCOLN, JR., newly elected president of IAA, has been with Air Reduction since 1924

varied maintenance applications of welding at plants of the Anheuser-Busch Brewery, Dow Chemical Co., Swift & Co., B. F. Goodrich, Sherwin Williams, Parke, Davis & Co., Schenley Distiller's Corp., Gillette Safety Razor Co., Ward Baking Co., Hershey Chocolate Corp. and Armstrong Cork Co.

Mr. Swarthout talked upon the welding and low-temperature brazing of air conditioning and refrigeration parts. The usually intricate design and arrangement of many of the parts and equipment lends itself much more satisfactorily to oxyacetylene than to other fabrication techniques, he maintained. Typical of the industry's products to which oxyacetylene applications are essential on a wide scale are welded pipe coils, air conditioning coils, finned coils, Freon shell and coil condensers, ammonia and Freon shell and tube condensers, heat exchangers, oil separators, forced convection unit coolers, etc.

Mr. Orange took issue with the scheduled title for his paper, "Scrapping and Heavy Cutting," and suggested an alternative title, "The Scrapper and the Builder." Among the uses of the torch as a builder, he cited the fabrication of heavy mechanical parts of intricate shapes, the substitution of cut and forged parts of alloy steel for steel castings, group cutting made possible by simultaneously operated torches. He also told of such uses in a steel mill as cutting cobbles from the rolls and conditioning heavy scrap to proper charging box size.

Second-Day Sessions

In keeping with IAA convention tradition, local engineering students were invited to attend the second day's sessions, and many did so. The two meetings and intervening luncheon were held at the Horace H. Rackham Memorial Foundation, an impressive marble edifice housing a little gem of an auditorium. Comfortably upholstered seats, ash trays within easy reaching distance of every hand and perfect ventilation contributed in no small measure to the enjoyment of the program.

Dr. Arthur R. Carr, dean of the college of engineering of Wayne University, served as general chairman for the day. The morning session was conducted by two co-chairmen: William E. Stirton, principal of Cass Technical High School, and Otis L. Smith, president of Weldit, Inc., Detroit. Co-chairmen for the afternoon session were Dr. Charles G. Duncombe, director of the department of chemical engineering, University of Detroit, and M. R. Scott, The Linde Air Products Co., Detroit.

John H. Zink, president, The Heat and Power Corp., Baltimore, posed some searching questions for the industry to answer: Is oxyacetylene welding good enough for the high-pressure field? Why hasn't the industry attempted multiple-bead operations like arc welding? Why aren't we doing a promotional job on radiant heating? Wouldn't a smoother flow be insured by reducing oxygen pressure from 2,000 psi cylinder pressure to 20 psi working pressure in three or four stages instead of by the present single-stage and two-stage regulators?

To some of these questions, Mr. Zink provided his own answers. He was confident that oxyacetylene welding is suited to piping of the full range of service temperatures and pressures. Moreover, he has been convinced by the practice in his own shop that multiple-bead techniques are as adaptable to oxyacetylene as to arc welding. The first bead should be made carefully to get penetration and proper bond, since it is the first bead or first two beads at the root of the weld that

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The revolutionary design of the flexible head accurately finishes jobs formerly impossible with hand operated oxy-acetylene equipment. The flexible head can be quickly adjusted to any angular position of its 180° arc travel. Previously inaccessible spots can easily be cut or welded with this unique arrangement. Versatile use as "right hand" or "left hand" torch. Tips are simply and securely interchanged with one turn of the side-opening tip lock-nut.

WRITE FOR BULLETIN C-48

THE *Hamilton* TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS

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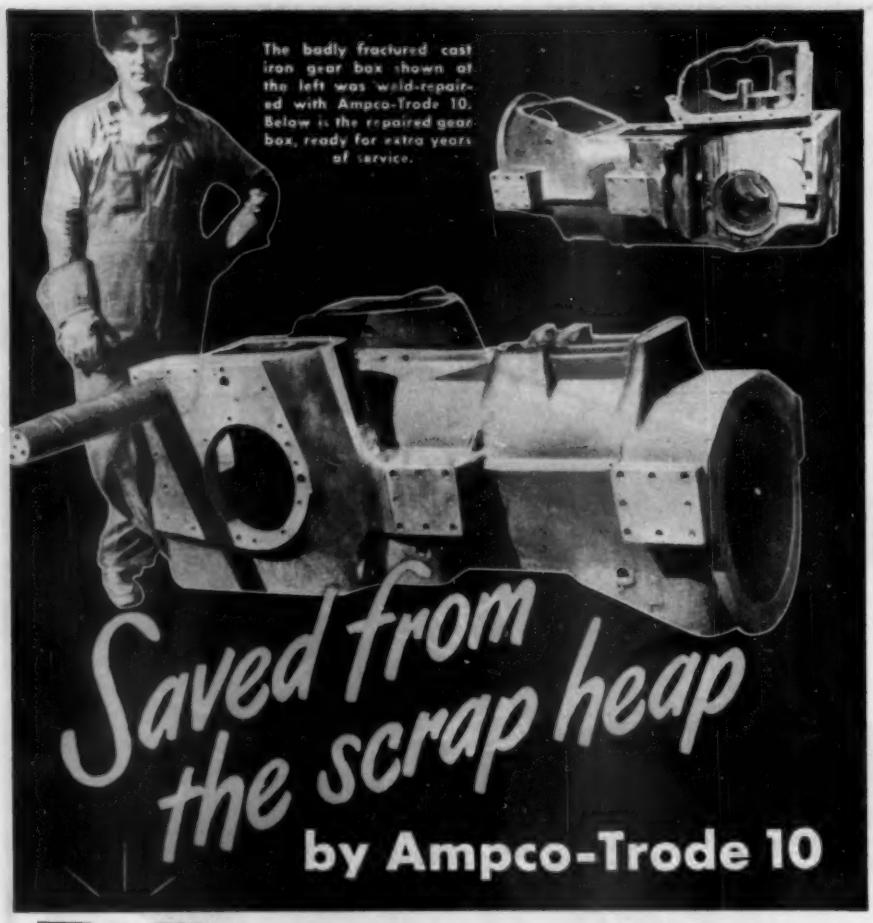
The badly fractured cast iron gear box shown at the left was weld-repaired with Ampco-Trode 10. Below is the repaired gear box, ready for extra years of service.
Saved from the scrap heap
by Ampco-Trode 10

Emergency repairs with Ampco-Trode 10 keep your equipment on the job longer, save replacement expense

When a few cents worth of Ampco-Trode Electrodes saves a part worth hundreds of dollars, that's real economy. And that is what happens every day in plants throughout the country. *You can make the same savings in your plant.*

Just keep a supply of Ampco-Trode 10 on hand. When breakdowns occur, your own maintenance men can have the part back on the job in a hurry. You avoid expensive down-time delays. And you avoid the cost of replacements.

The badly fractured cast iron gear box shown above was repaired with Ampco-Trode 10. That is a typical example of the way Ampco-Trode saves costly parts from the scrap heap. Ampco-Trode 10 is ideal for cast iron. Deposits are dense and ductile; they have a high strength-yield ratio. Ampco-Trode 10 gives a well-brazed bond with a low base-metal dilution. This prevents weld and fusion-zone cracking in highly stressed assemblies.

A supply of Ampco-Trode 10 on hand at all time will reduce "special electrode" inventories because it welds cast and malleable irons, steels, bronzes, brasses and dissimilar metals. Call your Ampco welding distributor today. Write for latest bulletins giving complete information on Ampco-Trode savings.

Ampco Metal, Inc. W-105
Dept. WE-7, Milwaukee 4, Wisconsin
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give the joint its strength. Oxyacetylene weldors should not deviate from the present customary 37½-deg bevel (75-deg joint) because this specification is written in many codes. There is no reason, however, why a 30-deg bevel would not produce joints of sufficient strength, Mr. Zink believes, though danger is to be expected if the angle is decreased still more.

Charles Ness, manager, acetylene research division, The Linde Air Products Co., Indianapolis, described the problems peculiar to the storage of acetylene in cylinders. The acetylene cylinder and its porous filler (which appears to be a solid rock-like mass with no room for either the gas or the acetone that holds it in solution) must pass drastic field tests prescribed by the Bureau of Explosives. Probably the most important of these is the bonfire test in which a fully charged cylinder is placed horizontally between layers of kindling wood sprinkled with kerosene. The wood is so placed that the flames do not contact the fusible metal plugs at each end of the cylinder, which safety devices are required to function only because of the conduction of heat through the cylinder shell. This test sets up more extreme conditions than would ordinarily be involved in a fire.

Other interesting papers at the morning session were given by J. I. Banash, consulting engineer, International Acetylene Association, Chicago, and R. F. Helmkamp, engineer, Air Reduction Sales Co., New York City. Mr. Banash's witty talk on practical safety considerations was aimed frankly at the student members of the audience but contained much of value for the others as well. Particularly noteworthy were his suggestions for welding containers that may once have held flammable materials.

Mr. Helmkamp covered the scope, methods and equipments of oxyacetylene cutting and displayed some 34 slides that pictured everything in flame-cutting from the simple oxygen lance to elaborate electronic tracing equipment.

Flame processes other than welding or cutting were handled in the afternoon session. Flame-hardening from the days of the Roman soldiers to the present was discussed by M. S. Rosengren, the Stearns-Roger Mfg. Co., Denver, Colo., who also

exhibited a new technicolor motion picture entitled "The Denver Flame-Hardener."

Mr. Rosengren believes that best results are secured by vertical travel and/or spinning on a vertical axis than by the older methods of horizontal travel and horizontal spinning. The most common reason for flame-hardening, he said, is to effect a wearing surface with high abrasion-resistant qualities in combination with a tough, ductile and shock-resistant core. Latest innovations are a thyratron-controlled d-c motor to vary spindle speeds and the use of a thermopile to measure the intensity of radiation given off by the workpiece during the heating cycle. By using the variable output of current from the thermopile through an electronic circuit, usually in a controlling-recording instrument, subsequent mechanisms can be activated through a series of relays to prevent the piece from being underheated or overheated and to quench it at just the proper time to obtain the desired end result.

Another technicolor motion picture was shown by H. O. Jones, mechanical welding specialist, Air Reduction Sales Co., New York City, in connection with his talk on mechanized equipment for oxyacetylene-welded tubing. Whereas 60 *inches* per minute was considered phenomenal production for welded tubing in 1924, some of today's tubing is turned out at over 200 *feet* per minute, with even faster speeds yet in prospect. Tubing ranging from 3/8 to 3½ in. OD may be produced by this type of tube mill.

N. H. Cuke, Canadian Liquid Air Co., Ltd., Montreal, covered the subject of flame-conditioning—known by such other names as flame priming, flame cleaning, descaling, dehydrating and paint burning. This process consists essentially of passing over or brushing a steel surface with multiple oxyacetylene flames in preparation for painting. The high heat of the flames drives off the chemically combined water in the surface rust, leaving only an anhydrous iron oxide that is easily removed by brushing. The process is equally adaptable to the preparation of old painted surfaces for repainting. More novel applications are the removal of rubber from rubber-lined steel tanks and the removal of many types of oil-based

For Better Wire Brushing ... at Lower Cost ... On All Welding Jobs!

WIRE CLEANING BRUSHES are made in several shapes for work in close quarters with electric Drills.

WIRE WHEEL BRUSHES come in six diameters from 4" to 12". Use on Bench and Portable Grinders.

WIRE CUP BRUSHES come in 4", 5" and 6" sizes. Use on Sanders.

Buy WHIRLWINDS*!

Here's a proven way to save plenty of time and hard work, while cutting wire brush costs, on all your welding jobs! Use Van Dorn Whirlwind Wire Brushes to prepare surfaces for welding by removing rust, scale and old paint. Use Whirlwinds after welding has been completed to remove light weld spatter, to clean and buff the surface for final finishing. Either way, longer-lasting Van Dorn Whirlwind Wire Brushes give you more for your money because . . . (1) an exclusive, patented lock *anchors* each tuft in place, separately, securely . . . (2) their *crimped* wire gives extra life and spring, maintains an even, compact brushing surface.

Van Dorn Whirlwinds are made in different models for use on Bench Grinders, Portable Grinders, Sanders and Drills. Order Whirlwinds today from your nearby Van Dorn Distributor. Write for free copy of our catalog to: The Van Dorn Electric Tool Co., 734 Joppa Road, Towson 4, Md.

*Trade Mark Reg. U. S. Pat. Off.

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"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

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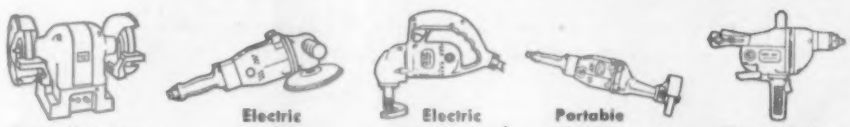

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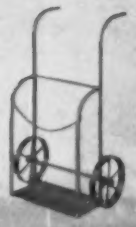
Adams

designed balance means easier handling

The careful balance, the light, rugged, welded tubular construction of Adams cylinder trucks, means easier handling of welding cylinders of any size.

Adams Trucks are designed to load easier and to roll easier. There are 18 labor saving Adams Trucks for any shop requirement.

Jobbers everywhere are reporting increased use of small cylinders, creating a demand for Adams small cylinder trucks. You too will find these rugged little trucks make even small cylinder handling easier.



No. 140

No. 142

No. 141

No. 143

Adams cylinder trucks are nationally sold only through Welding Supply Distributors.

No. 143—Ball bearing, rubber tired, tandem model, for crowded quarters, handles 70 to 122 cu. ft. oxygen cylinders; 60 to 100 cu. ft. acetylene cylinders.

No. 142—Tandem model, handles 70 to 122 cu. ft. oxygen cylinders; 60 to 100 cu. ft. acetylene cylinders. Steel wheels.

No. 141—Ball bearing, rubber tired, conventional model for 70 to 122 cu. ft. oxygen cylinders; 60 to 100 cu. ft. acetylene cylinders.

No. 140—Conventional model for 70 to 122 cu. ft. oxygen cylinders; 60 to 100 cu. ft. acetylene cylinders. Steel wheels.

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weatherproof coatings from concrete stucco or masonry.

Those stubborn souls who believe in remaining until the last dog is dead were well rewarded this time by the final paper on low-temperature stress relieving. A new method of stress relieving at temperatures of approximately 350 F instead of the conventional 1,100-1,200 F was detailed by T. W. Greene, engineer, The Linde Air Products Co., New York City. This method has been successfully applied to large ocean-going ships and also to pressure vessels and to large welded structures in the field. It is suitable, in fact, to use whenever conventional furnace stress relieving cannot be done.

In low-temperature stress relieving, the results are accomplished by inter-action between progressively heated increments of plate and adjacent increments of cooler weld. This action may be thought of as a reversal of the kind of action between increments of heated weld and cool plate that produced the original welding stress. The progressive heating is accomplished by moving oxy-acetylene flames parallel to and on each side of the weld to provide a moving zone of heat. Water or air-water sprays are then allowed to impinge on the plate approximately 6 in. behind the advancing flames. The cooling takes away the surplus heat after the stress relieving has been accomplished but its more important function is to assist and supplement the expansion forces set up by the heating.

Though this method sounds simple, measurements taken by electrical resistance strain gauges have proved it to be fully effective. In one example cited by Mr. Greene, longitudinal residual stresses averaging about 43,000 psi in the weld as-welded were reduced to negligible value by the low-temperature stress-relieving treatment.

Optimum results were secured with a ribbon-type single flame heating head 6 to 8 in. wide, with the centerline of the heated area 5 in. from the centerline of the weld, and with a traveling speed of about 16 ipm. These values may vary somewhat, depending upon plate thickness and other conditions. The optimum maximum temperature of 350 F, however, has been found applicable to all plate thicknesses from 1/4 to 11/4 in.

The Technical Slant

Farmers

WELDING HELPS FOR FARMERS. Published by The James F. Lincoln Arc Welding Foundation, Cleveland 1, 1948. Simulated leather, 5¼ x 8⅜ in.; 448 pages. Price $1.

Welding Helps for Farmers contains hundreds of ideas, helps, hints and pictures of handy equipment sent in by farmers from every section of the country. Here are described how the farmers themselves, without any special training, used arc welding to repair holes in saucepans, remove rusted nuts, construct complicated combines, make branding holders for cattle and build all sorts of gadgets.

This book is also a human-interest story of the resourcefulness of American farmers. Once high-line electricity and modern welders had put practical power tools in their hands, it is astonishing what they were able to do.

The first six sections give general information about the use of welders on farms and include detailed directions for operating an arc welder. Directions for learning to arc weld as well as general welding information are also given. The remainder of the book is devoted to the farmers' own stories of tools and equipment they built and how the work was done. Altogether, the volume is a handy manual for farm owners.

* * *

Symbols

STANDARD WELDING SYMBOLS. Published by American Welding Society, New York City, 1947. Paper, 6 x 9 in.; 67 pages. Price 50 cents.

In establishing the 1947 *Standard Welding Symbols*, the American Welding Society carefully considered that designers must have access to a standard set of symbols adaptable to every welding process in use. It will be recalled that the 1942 Symbols and earlier publications, dating back as far as 1929, were concerned only with gas, arc and resistance welding. The revised edition, however, covers 34 processes currently utilized in various industries. The rules adopted should provide adequately for all the needs of management, designers and shop men.

The method of presentation has been revised to a step-by-step presentation in lecture-type form. The rules have been expanded to include a means of indicating welds having root penetration. Other features are the dropping of the confusing terms "near side" and "far side" from the nomenclature, the addition of 45 illustrations to show various applications of the symbols and a chart providing a compact summary of the use of the welding symbols.

This 1947 standard is the accruement of twenty years in industrial experience, effort and thought. Keeping pace with the growth of welding, it represents an ultimate in simplification. Consequently, we believe, only minor changes should be necessary for many years.

precision regulation

TWO-STAGE
REGOLATOR

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OXYGEN
ACETYLENE
HYDROGEN

The precision performance of the two-stage RegOlator is especially desirable for piped distribution systems and other applications where large volumes of high pressure gases must be controlled accurately.

Two-Stage RegOlator Gives You Plus Performance!

Constant delivery pressure regardless of drop in pressure at the inlet . . . Patented design incorporates nozzle-type first stage counterbalanced by stem-type second stage . . . Triple action cartridge filter eliminates troubles usually caused by rust, dust or dirt.

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Pioneers and Leaders in the Development and Manufacture of Precision Equipment for Using and Controlling High Pressure Gases

Are You A Phone Bill Watcher?

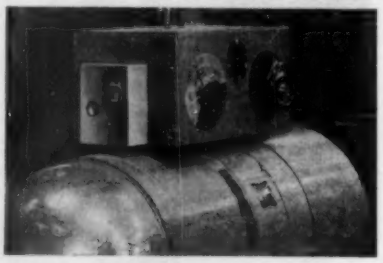
One Idle-Running Welder Can Cost You More Than 150 5¢ Calls Each Month!

YES, IT'S TRUE . . . The cost of the power *wasted* by an idle-running 300 or 400 ampere d.c. welder would pay for 150 five-cent phone calls each month! And tests show that welding machines *run idle 50 to 95% of the time!*

Power is not the only item you waste. Your welder's service life is slipping away, too — all the time it's running. Idling motors drag down your power factor, disturb power loading. It all adds to your operating cost — needlessly.

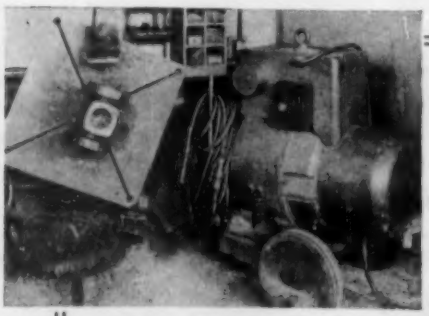
Needlessly, because now there's a reliable means of *automatically* starting your welder when it's needed and stopping it when welding ceases. The answer is the DV Automatic Start-Stop Welder Control. Job-tested DV controls start the welder the moment the electrode contacts the work piece, and automatically shut down the welder 1 or 2 minutes after welding stops. The time delay (adjustable) keeps the set running while the operator changes electrodes, positions his work, etc.

The average number of starts with DV controls is but 15 per 8-hour shift, yet the savings in reduced idle time have—on hundreds of installations—paid the entire cost of DV controls in less than a year!



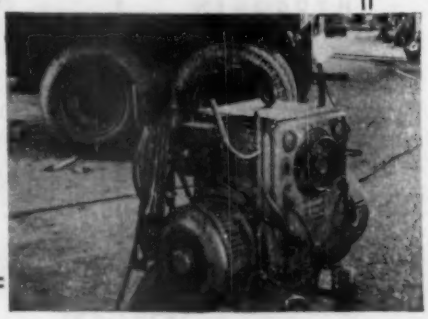
An accurate arc time totalizer (optional) records actual welding time in minutes. Production and cost data can easily be obtained without the bother of measuring weld footage or weighing rod.

DV controls are easily installed on any electric-driven d.c. welder equipped with magnetic starter. They do not interfere with the regular welder controls, nor with the operator's usual welding technique.



Nobody can forget to turn off the welder when DV Controls are on the job. The result is minimum idle-running time — lower power bills, longer welder life.
(*Photo taken at Merco Nordstrom Valve Company's Oakland, California, plant.*)

Trailer Shops have lots of fit-up time that keeps welders running idle — unless DV Controls are there to stop and start them automatically. The first DV Control installation in this San Francisco branch of the Fruehauf Trailer Co. produced such savings that every welder in the shop was DV-equipped.



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D-V WELDING CONTROLS

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GOLD DREDGE KEPT DIGGING

(*Continued from page 50*)

flame-cutting prior to rewelding with stainless-steel electrodes. Eyes were to be brought back to round and bushings reseated tightly.

Since extra buckets had been purchased some time ago, it is possible to rework the worn buckets without interruption to the line. One man can rebuild a bucket base back to the original point in from 8 to 10 hours. Front and back eyes are built up to round in another day. There is usually in excess of 1 in. of wear at the back eye. It has been the custom to weld a 4-in. or 5-in. strip of mild steel on each outside edge of the back eyes for safety. This is done in 16 man-hours.

It has been found that no extraordinary precautions such as water baths need be taken in welding these manganese-steel castings. All welding is done at ambient temperatures, thus materially reducing time and cost.

Materials and Cost

The tumbler is a low-alloy steel casting containing 0.35 to 0.45% carbon, 0.30 to 0.35% silicon, 0.05% sulphur (max.), 0.05% phosphorus, 0.75 to 0.85% manganese, 2.5 to 3% nickel, 0.25 to 0.35% chromium. Tensile strength of this material is 90,000 to 110,000 psi; elastic limit is 45,000 to 55,000 psi. Elongation is 18 to 22%, reduction of area 25 to 40%.

The buckets are all of cast manganese steel. Tubing used in rebuilding the tumbler was seamless steel tubing of 2¼-in. OD and ¼ in. wall thickness. Filler bars were rolled nickel-manganese steel bars of ¾ by 4 in. stock cut to size. Edge strips were of 18-8 stainless, 1/8 by 2 in., lengths as needed.

To weld the above strips, filler bars and tubes, 3/16-in. electrodes of 18-8 or 19-9 Cb stainless were employed. The Two-Tone build-up was accomplished with ¼-in. AWS E-7010 electrodes and special 3/8-in. cast manganese filler rods containing 30% manganese, 10% nickel, 2% vanadium and 1.75% carbon.

Costs and amounts of materials used are given in Table I. These costs compare very favorably with

new replacements. Figuring the cost of installation of a new tumbler without the saving in loss of production, it is doubtful that such a job could be done for less than $11,000. Total cost of the welded build-up was $1,120 or one tenth that figure.

The last purchase of buckets, made in 1946, indicated that their price was in excess of $500 each. Bases were built up for approximately 10% of the replacement cost of new buckets.

Character of Deposit

The deposit of filler material on the tumbler is very hard and tough. Brinell hardness is 250 as deposited, and the deposit will impact harden to above 500 Brinell. As deposited, the deposit has small longitudinal cracks, which will disappear under impact. The deposit is excellent for resistance to impact, both edge and flat, but it is not forgeable and cannot be annealed nor machined. It has a rated tensile strength of 70,000 psi when welded with E-6010 electrodes and must approacch 80,000 psi with E-7010 electrodes.

After two weeks of operation the deposit had shown no signs of edges cracking or chipping out. Wear plates placed directly upon the welded surfaces without any grinding showed no signs of movement until after six days of operation, at which time approximately ¼ turn on the nuts was obtained by using a slugger wrench held tightly with rope blocks. Normally, plates had to be tightened within two hours of changing, starting the tightening with a light hand wrench.

About 40 of our buckets have been rebuilt by this technique. Some of our early rebuilt jobs showed signs of failure of the base metal on edges of the bases. This was because of faulty welding technique in using the cast filler rods as "dams." Discontinuance of this practice caused edge failures to cease.

Rebuilt buckets placed in the line with new buckets are showing less wear than the new ones at the point of contact with the lower tumbler. This is because of the greater hardness and resistance to impact of the welded bases. In six months of operation, we have discovered no failures nor cracks in any of our rebuilt buckets.

HIGH PRESSURE POT VALVE QUICKLY REPAIRED WITH BRIDGEPORT'S No. 192 LOW-FUMING ROD

This cast steel pot valve, operating under 12,000 lbs. hydraulic pressure, developed a dangerous leak in a defective area. After experimenting with other welding metals, this valve was successfully repaired with Bridgeport's No. 192 Low-Fuming Bronze Aside from reducing valuable shutdown time to a minimum, much greater saving was made by repairing instead of replacing this very expensive valve.

Braze-welding with bronze is replacing other methods for large and small jobs. Only local pre-heating, without elaborate pre-heating and slow cooling set-ups, saves valuable time. Strength and soundness as well as freedom from brittleness often make a repaired part stronger than original equipment. Have you a copy of Bridgeport's twenty-four page booklet "Bronze Welding Alloys"? Write for one today. It contains much valuable information on braze-welding.

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BRIDGEPORT No. 192 BRONZE—LOW FUMING
General purpose alloy. Ideal for repairing heavy-duty equipment as well as small parts—building up wearing surfaces—joining parts in industrial and construction work.

NAVAL BRASS
Fuses readily at 1625° F. Recommended for uniting cast iron and steel parts—building up wearing surfaces—joining parts in industrial and construction work.

BRIDGEPORT MANGANESE BRONZE (NAVY)
Recommended for strength and toughness in repairing cast iron and steel castings—building up worn surfaces—joining parts in industrial and construction work.

BRIDGEPORT No. 1232 SILICON BRONZE
Used for oxyacetylene, carbon arc or metallic arc welding methods for making silicon bronze storage tanks, automatic heaters, corrosion-resisting ducts, structural sections, vats, etc.

BRAZING ROD
Satisfactory for conditions that are not subject to great wear or heavy shock loads.

Bronze Welding Rod A PRODUCT OF BRIDGEPORT BRASS

Makes a Perfect WELD of CAST IRON to STEEL

NI-ROD WELDS are the friend of the production boss who wants to cut out drilling, tapping, bolts and rivets

Look around your shop and count how many metal parts are being put through machine operations. Count how many take up *machine time* that you might better use for more production. Then consider how Ni-Rod* welds of iron-to-steel actually add strength, and save machine shop time:

EMBLEM OF SERVICE
INCO NI-ROD
TRADE MARK

Take a good look at the cast iron spider in this wheel. It's *welded* to the sheet-steel pressed rim. Welded with Ni-Rod electrodes for hard use on the Mt. Vernon Lime and Fertilizer Spreader.

Before Mt. Vernon found out about Ni-Rod welding, they tried other ways of fastening these spiders and rims together. But you know that drilling and tapping mean extra production steps, and that while bolts can fail, *welds* add strength.

What you may *not* know is that really strong, sound welds can be made quickly between cast iron and steel.

Those strong, tough welds are pie for Ni-Rod. If necessary they're easy-to-grind welds, too, so the finished job looks neat and workmanlike. That brings smiles to the faces of salesmen and dealers.

Want to know how Ni-Rod can help you, *free?* Drop us a card asking for special sample package of three Ni-Rod electrodes. Any diameter you choose: 3/32", 1/8", 5/32", or 3/16". They're yours for the asking!

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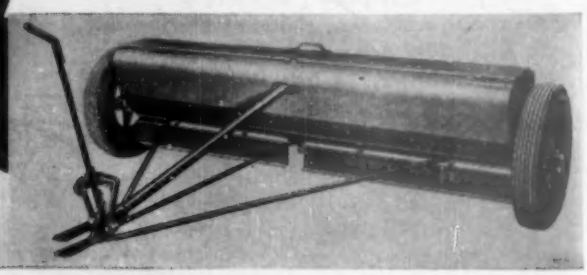


Wheels of the Mt. Vernon Lime and Fertilizer Spreader (left and below) are now Ni-Rod welded—cast iron spider to steel rim. Thus much machine work is saved and appearance is improved.

Permissible Loads for Fillet Welds per Inch of Length

Permissible Loads for Fillet Welds per Inch of Length

BY LEO BERNER

NOMINAL THROAT WIDTH = .707 FILLET SIZE		*SAFETY FACTOR OF 4 — PERMISSIBLE STATIC STRESS 15,000 PSI					SAFETY FACTOR OF 3 — PERMISSIBLE STATIC STRESS 20,000 PSI					SAFETY FACTOR OF 2.4 — PERMISSIBLE STATIC STRESS 25,000 PSI				
		Unit Stress in psi.					Unit Stress in psi.					Unit Stress in psi.				
	% of Static	Static	Pulsating †N1	Pulsating ‡N2	Reversing N1	Reversing N2	Static	Pulsating N1	Pulsating N2	Reversing N1	Reversing N2	Static	Pulsating N1	Pulsating N2	Reversing N1	Reversing N2
	Load →	100%	45%	30%	27½%	18.3%	100%	45%	30%	27½%	18.3%	100%	45%	30%	27½%	18.3%
	P.S.I. →	15,000	6,750	4,500	4,150	2,750	20,000	9,000	6,000	5,500	3,660	25,000	11,220	7,500	6,890	4,675
	Weld Size	Permissible Load in Lbs. Per Inch of Length					Permissible Load in Lbs. Per Inch of Length					Permissible Load in Lbs. Per Inch of Length				
.1325	3/16	1,990	895	596	550	365	2,650	1,190	795	738	475	3,310	1,485	995	910	620
.177	¼	2,650	1,192	795	732	486	3,540	1,590	1,060	970	635	4,410	1,980	1,325	1,215	826
.221	5/16	3,320	1,490	998	916	608	4,420	1,990	1,335	1,215	795	5,520	2,480	1,655	1,530	1,034
.265	3/8	3,970	1,790	1,195	1,100	730	5,300	2,380	1,590	1,455	953	6,625	2,980	1,985	1,825	1,240
.309	7/16	4,650	2,090	1,390	1,280	850	6,200	2,780	1,855	1,700	1,130	7,725	3,470	2,320	2,130	1,445
.353	½	5,300	2,385	1,590	1,465	972	7,075	3,180	2,120	1,940	1,290	8,825	3,960	2,645	2,435	1,650
.441	5/8	6,610	2,980	1,990	1,830	1,215	8,750	3,980	2,650	2,425	1,615	11,050	4,950	3,310	3,040	2,065
.53	¾	7,950	3,580	2,380	2,200	1,460	10,600	4,770	3,180	2,910	1,905	13,250	5,940	3,970	3,640	2,480
.619	7/8	9,280	4,175	2,780	2,565	1,700	12,400	5,560	3,710	3,400	2,220	15,450	6,930	4,640	4,250	2,890
.707	1	10,600	4,770	3,180	2,930	1,943	14,140	6,360	4,240	3,885	2,540	17,650	7,930	5,300	4,860	3,305
.795	1⅛	11,900	5,350	3,580	3,295	2,185	15,900	7,150	4,750	4,360	2,860	19,850	8,930	5,950	5,460	3,720
.883	1¼	13,250	5,960	3,980	3,660	2,430	17,700	7,950	5,290	4,860	3,170	22,100	9,925	6,625	6,075	4,130
.97	1⅜	14,550	6,550	4,380	4,030	2,675	19,450	8,750	5,810	5,340	3,495	24,300	10,900	7,300	6,675	4,550
1.06	1½	15,900	7,150	4,770	4,400	2,915	21,200	9,550	6,350	5,730	3,810	26,500	11,900	7,950	7,300	4,960

*Safety Factor Based on Ultimate Stress of 60,000 psi.

†N1 = 100,000 Cycles
‡N2 = 2,000,000 Cycles
} Cycles at Which Weld Will Fail With Safety Factor of 1.

AS ONE WELDING ENGINEER TO ANOTHER!

TRY KERN *for* BETTER WELDING!

says Bill DeMint, welding engineer, Ridge Metal Products Co., Chicago, Ill.

"Here's What Kern AC Welders Are Doing In Our Welding Department"

"We have found in our plant, through actual experience, that we get better welding and higher production from our KERN AC WELDERS. This is due, in our opinion, to the ability of the machine to produce an arc that is easier to strike and hold; also to the fact that our operators do not have to fight arc-blow.

"In addition, our power costs are a good deal less, due we feel to the high efficiency and reduction of idling losses. Down-time so far as our KERN machines are concerned is practically eliminated.

"We bought the first of our nine KERN welders last fall. All of them are operating 16 hours a day, five days a week at a high duty-cycle.

"Our present plans call for a complete switch-over to KERN AC WELDERS within the near future.

"I might add that I used to be what is ordinarily known as a 'DC-man'."

"Here's The Type Of Work We're Turning Out"

"We're fabricating heavy-duty disc assemblies out of 1/2" mild steel bars, 3/8" high carbon steel, 1/4" channel iron, and 3/8" angle iron. We use 3/16" and 7/32" electrodes. Each unit requires about 61' of welds."

Write Today and Learn How You Can Try a Kern Welder In Your Shop On Your Jobs Without Obligation!

JOHN A. KERN COMPANY

224 NORTH LOOMIS • CHICAGO 7, ILLINOIS

5,000,000 Youngsters Need Our Help Now

THE bumper wartime crop of babies, about 5,000,000 larger than the population experts expected, is reaching school age.

At school these youngsters should find a good education awaiting them. That is their most cherished American birthright.

But unless something is done quickly, millions of these children will be cheated. They will crowd into classrooms already run on double shifts. They will move in with children who are now sitting two in a single seat. They will read germ-loaded books mangled by a generation of use by grimy hands.

I

So the continuing crisis in American education is given a new twist by unexpected pressure on school plant and equipment.

The U. S. birthrate has jumped by leaps and bounds. Instead of declining in the '40s, as the experts expected it would, the rate climbed from 17.9 per thousand in 1940 to 21.5 in 1943. It jumped to 25.9 in 1947, an increase of 45 percent since 1940. Result—by 1956 elementary school attendance in the United States is expected to jump from 18,200,000 to more than 23,400,000, an increase of about 5,200,000, or more than one-fourth.

The rush has already begun. It will pick up speed next fall.

Now, while this pressure has been building up, our public schools and their equipment have been running down—first through inevitable wartime neglect, then because inflation and material and labor shortages made it difficult to catch up.

If we are to give this bumper crop of youngsters the break they deserve—and reach the educational standards the nation needs—we must speedily do a major job of educational rehabilitation and expansion.

II

Some headway has been made in overcoming the teachers' salary crisis.

Teachers' salaries are improving. Pay problems were driving good teachers away from their posts in droves not long ago. But in the year since the 57th editorial in this series emphasized that crisis, the average teacher's annual salary has increased about $300—from $2250 to $2550.

True, increases vary enormously from state to state and from town to town. In a few states the average increase has been $500; in some less than $100. But, for the nation as a whole, last year's increase put teachers about even in the race with the cost of living. After taxes, their salaries have risen 68%, and the cost of living 67%, since 1939. In terms of pay increases, however, they are not nearly as well off as are industrial workers, whose average weekly wages after taxes have risen 108% since 1939. They are far behind farmers, whose net income is now four times what it was in 1939. And teachers had notoriously low salaries to start with.

A great deal more needs to be done in raising salary standards to put our school system on a firm footing. There are still about 100,000 teachers, nearly 12% of all public school teachers, who hold temporary or emergency credentials. They cannot meet

prevailing standards, and not very severe standards at that, for persons holding their posts.

The salary crisis, however, is easing.

III

But now comes the new crisis in school buildings and equipment.

We would have been hard put to get our schools back into shape after years of wartime neglect—even without a booming birthrate complicating the problem. Right now, 85% of all public school buildings need major remodeling to remove health and safety hazards.

And we aren't building enough new schools to keep up with current needs, to say nothing of catching up on those we were not able to build during the war years. School construction expenditures for 1948 are estimated at $375 million – which is less than what was spent in 1939. With building costs twice as high as they were in 1939, that means we aren't even holding our own—we are falling further behind.

And now comes the rush of war babies.

IV

We must spend at least $11 billion on new schools and equipment in the next decade.

Public and elementary schools must have $6.6 billion. Equally important, another $4.4 billion must be invested in buildings and equipment in our private schools, colleges and universities if they are to meet the demands which will be made upon them. The private school and the privately endowed university are doing their full share and doing it well. The need for them is increasing.

These figures cover only rockbottom needs for educational plant and equipment. But statistics are a very restricted recorder of this crisis.

You can see it better, I'm sure, in schools not very far from your home. There are schools with leaking roofs and outdoor toilets in our greatest cities. There are schools where students still use histories and geographies copyrighted before 1920—books with no mention of World War I, the depression of the 1930's, the Russian Revolution or the rise of the dictators. There are countless schools where modern methods of visual education are completely unknown.

All of these conditions promise to get worse – promptly – as that scheduled 5 million increase in the school population gets rolling.

V

The Metropolitan Life Insurance Company does not indulge in lurid prose. It says after painstaking study of the educational crisis that:

"Unless definite measures are taken immediately . . . large numbers of American boys and girls will be deprived of an adequate education."

Currently we are deeply concerned about our military defenses. We are taking, and I think rightly, emergency measures to strengthen them. But we must regard our schools as a part of our national defense as vital as are our armed forces. This is particularly true in these times of fifth columns and ideological warfare.

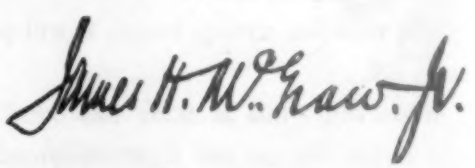
If we are wise, we will raise our sights. We will give the continuing crisis in education the same urgent attention being given the more obvious but no more real crisis in national defense.

Go to the school house in your neighborhood and discover what needs to be done to provide for the rising tide of young Americans. Ask your school board and your school administrators and teachers how you can help them.

That is good citizenship.

That is patriotism.

That is our duty to the oncoming generation.



President, McGraw-Hill Publishing Company, Inc.

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A KNOCKOUT IDEA FOR REPAIRING DAMAGED GALVANIZED SURFACES

Amco Galvanizing Compound permanently repairs damaged galvanized surfaces . . . marred by welding, forming, bending, fabricating, riveting, threading, abrasion, assembly.

Equal in strength and corrosion resistance to the original hot-dipped galvanized surface. Meets U. S. Army and Navy specifications including 600 hour 20% salt spray test. Easily applied by unskilled labor. Bonds perfectly to base metal without damage to surrounding galvanizing. In powder, stick and bar form.

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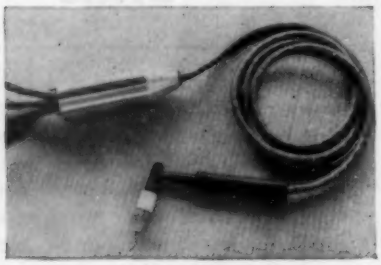
New Products to Use

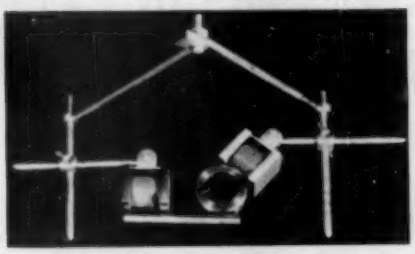


MANUAL INERT-ARC holder for production welding. Uses tungsten or carbon electrodes up to 3/16 in. diam

Inert-arc Holder

DESIGNED for continuous production work by the inert-gas-shielded arc welding process, a new manual holder features water cooling, a gas cap made of non-conducting material, an all-plastic exterior and a light, flexible cable encased in a translucent plastic cover. It has a current capacity of 300 amp, a-c or d-c, and is fully insulated for high-frequency current. Weighing only 28 oz and approximtely 10 in. long, the holder will accommodate tungsten or carbon electrodes up to 3/16 in. diameter. AIR REDUCTION SALES CO., 60 E. 42nd St. New York City 17.

* * *



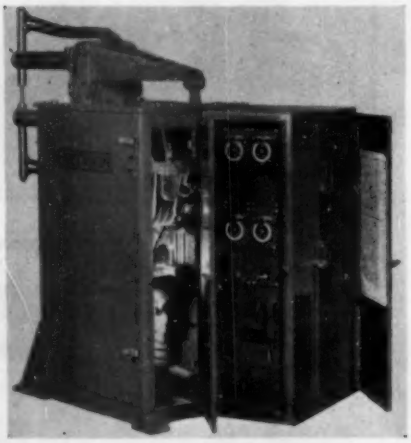
"MINUTE MAN" magnetic positioner for welding small ferrous parts

Magnetic Positioner

"MINUTE Man," a new magnetic welding positioner, is said to save time and trouble in the joining of small ferrous parts or pieces. It consists of a sturdy V-frame equipped with two permanent Alnico magnets, each measuring 2 by 2 by ⅛ in. These grip the metal pieces and hold them in virtually any position. Frame has two horizontal arms 10 in. long and two vertical arms 6 in. long. Distance between the two arms is varied, as is the height on the vertical arms. Frame has a spread of 18 in., and a ground clamp may be attached to the metal pad at the pivot point. A small auxiliary chuck is supplied for holding pieces of exceedingly small surface areas.

Positioner may also be adapted for non-ferrous and non-magnetic materials by employing C-clamps which are gripped by the magnets. THE DU MONT CORP., Greenfield, Mass.

* * *



SPOT WELDER for production lines has mechanism in three parts for adjustment

Spot Welder

A NEW air-operated spot welder available in 10 and 20-kva ratings is offered by PRECISION WELDER AND MACHINE CO., 138 E. McMicken, Cincinnati 10. Among its features are: visible coolant flow from electrodes and transformers; eight-step tap switch permitting 50% secondary voltage adjustment; self-aligning knee and gib assembly with spreader screw for horn removal; water-cooled ejector holders with standard replaceable electrodes. The machine is assembled in three sections, any of which may be adjusted in a few minutes.

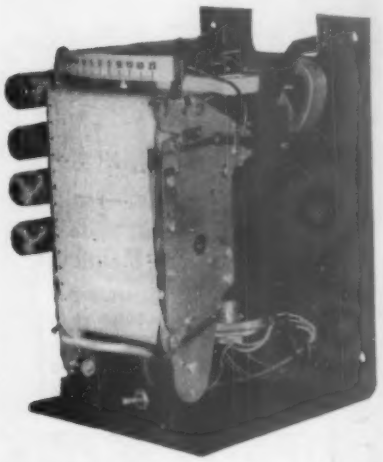
* * *

Electrodes for Cast Iron

"CASTINGWELD" and "Freemachineweld," two new electrodes for d-c or a-c welding of cast iron, were developed to hold thermal stresses to a minimum and prevent extreme hardness in the heat-affected zone. Castingweld uses a mild-steel core wire and a special coating of low melting point. Coating is said to overcome difficulties with entrapped slag often encountered in welding cast iron. The deposit is relatively hard and therefore not machineable. This electrode is available in 3/32, 1/8 and 5/32 in. diameters.

Freemachineweld incorporates a pure nickel core wire extruded with a special coating developed for use on cast iron. The nickel core assists in controlling the welded stresses as the melting temperature of nickel is relatively low and its expansion and contraction more closely matches that of cast iron. Resultant weld is soft and readily machineable. Freemachineweld is available in 1/8 and 5/32 in. diameters. WESTINGHOUSE ELECTRIC CORP., P. O. Box 868, Pittsburgh 30, Pa.

* * *



PHOTOELECTRIC wattmeter records d-c power or a-c up to 10,000 cycles

Photoelectric Recorder

ANALYSIS of welding circuits is one application of a new photoelectric recording unit for either a-c or d-c power. It consists of a high speed photoelectric recorder and a newly designed wattmeter compensated for frequency and power-factor changes. Chart speeds varying from a half inch per hour up to 72 in. per minute may be obtained by using different combinations of chart carriages and rate gears.

When the instrument is calibrated for a particular frequency, its accuracy is plus or minus 3%. When calibrated for 60 cycles, it can be used over the entire alternating range of from 60 to 10,000 cycles per second at unity power factor with an error of plus or minus 5%. Power-factor error when going from 0.5 lagging to 0.5 leading is only plus or minus 3%.

Current circuit is rated either 5 or 10 amp, with the potential circuit either 120 or 240 volts. GENERAL ELECTRIC CO., Schenectady 5, N. Y.

* * *

R-W Electrode Holder

A LEAKPROOF resistance-welding electrode holder is arranged so that the water circuit forces water against the head of the electrode tip regardless of length. Water circuit is sealed so that there is no leakage. An ejector plug simplifies tip removal and minimizes tip damage. The holder barrel is made of an alloy having high electrical conductivity and physical strength. P. R. MALLORY & CO., INC., Indianapolis 6, Ind.

OPERATOR stands on table top of positioner and can tilt or rotate work

Welding Positioner

A NOVEL welding positioner, model WP-3, has a self-leveling table on top for an operator to stand on. He can rotate and change the angle of tilt from the table, permitting him to work on all points without change of position. A push-button control is provided for all operations including power elevation. Positioner measures 7 ft by 9 ft, weighs approximately 1,300 lb and has a dual capacity of 3,000 and 4,600 lb. HARNISCHFEGER CORP., WELDING DIVISION, 4400 W. National Ave., Milwaukee 14.

* * *

POWER ratio of this self-locking pliers varies from 38-1 to 100-1

Self-Locking Plier

"LOCK-Line" self-locking pliers uses double compound eccentric linkage to gain instant lock by normal hand pressure. Power ratio estimates vary from 38-1 to 100-1. Special cam action gives plier cutting pressure handling 19-strand No. 1 electric cable, 30-penny spikes and ¼-in. bolt stock or rod. Plier is made of drop-forged chrome-vanadium steel with hardness rated at Rockwell RC 52-54 and is designed to lock on 11/16-in. between deepest jaw serrations. When locked in position, plier will generally strip object before relaxing grip. ROSS MANUFACTURING CO., 300 Montgomery St., San Francisco 4, Calif.

* * *

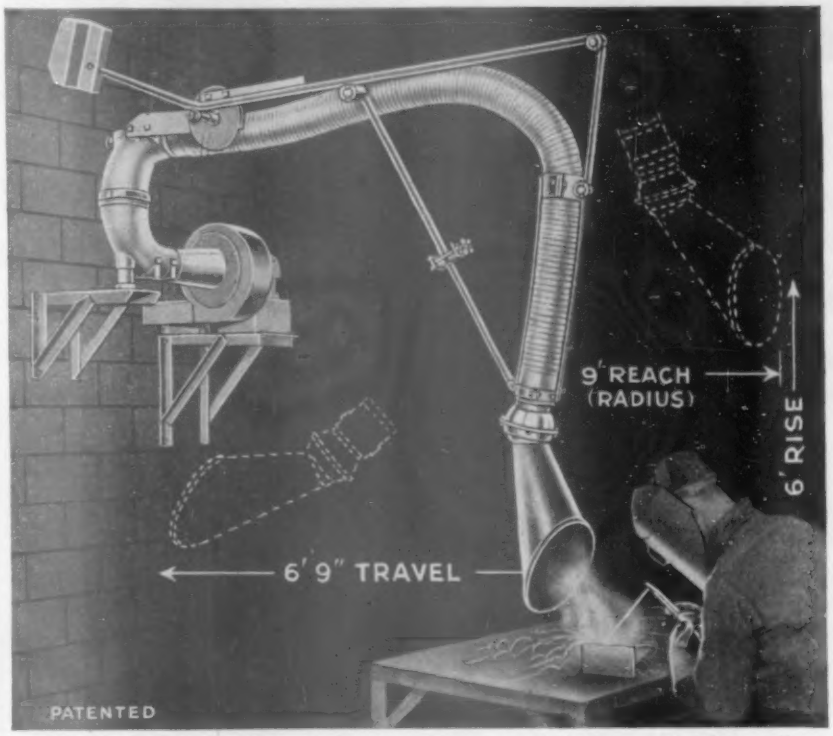
Warning: Not D-C

IN a "New Products" item entitled "Welding Tongs", (page 74, May, 1948) the incorrect statement was made that this tong-type spot welder would operate from d-c lines. It was built to operate from a-c only. Operation from d-c lines will damage it, THE WELDING ENGINEER is informed by the manufacturer, Miller Electric Mfg. Co., Appleton, Wis.

"I WORK IN CLEAN FUME-FREE AIR —thanks to our RUEMELIN FUME COLLECTOR"

Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated *at their source*, thus improving working conditions, lessening fatigue and paving the way for increased plant production.

The Ruemelin Fume Collector hood can be instantly placed where needed anywhere in the booth welding area. No tedious adjustments necessary. Just pull the inlet hood to the welding position and you are ready to go. Approved by state industrial commissions and by compensation insurance companies. Simple to install. Thousands in service. Many users send in repeat orders. Write for bulletin 37-C today.



Standard Model D-5310 with hood reaching out 9 feet from wall. Also available in Long Reach Model D-5342 with hood reaching out 15 feet from wall.

RUEMELIN MFG. CO.

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MANUFACTURERS AND ENGINEERS • SAND BLAST AND DUST COLLECTING EQUIPMENT • WELDING FUME COLLECTORS

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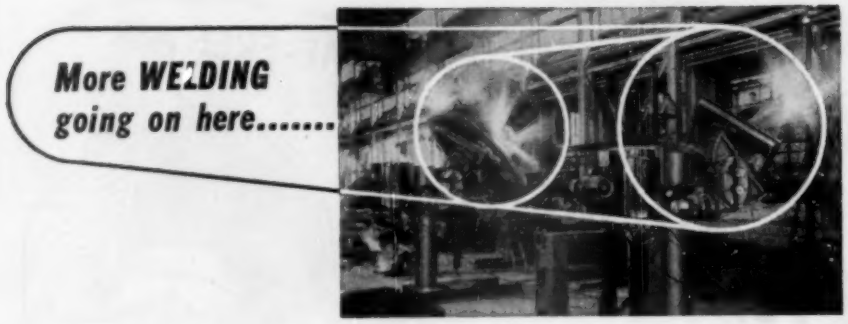

More welding and less time spent in flopping, propping up and crawling around weldments is the end result of the C-F Positioners in this welding department.

Mounted on C-F Welding Positioners, weldments can be quickly brought into position for a downhand pass—better, more uniform welds with resulting economies and production increases follow. Welders spend more time welding when they work with C-F Positioners because one "set-up" on the table allows them to maneuver the job without assistance, whether hand or power operated Positioners are used.

Power operated, variable speed C-F Positioners, with table rotation speeds in any range from 0 RPM and up, coupled with table tilt to 135° from the horizontal make them the logical choice for any production welding operation. Like all C-F Positioners, they have drilled tables for easy set-ups or tables can be quickly removed for installation of special fixtures or jigs. Write for Bulletin WP 22. CULLEN-FRIESTEDT CO., 1309 S. Kilbourn Ave., Chicago 23, Ill.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

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"E-Z OPENER" minimizes waste of gas and air from cylinders

Cylinder Opener

A quick-opening device for compressed gas cylinders saves valuable gasses by permitting cylinder valve to be closed tighter when cylinder is not in use. The "E-Z" opener is a one-piece casting that fits over the standard cylinder valve handle and is securely tightened by a knurled set screw. Main valve may be easily turned without recourse to a wrench. NUTMEG INDUSTRIES, 45 Deacon St., Bridgeport 7, Conn.

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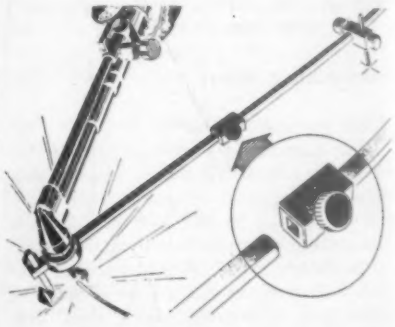


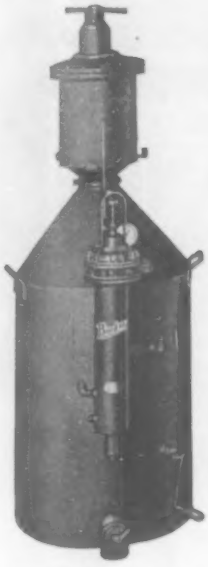
EXTENSION bar facilitates circle cutting

Radius Extension Bar

A RADIUS extension bar has been developed as an accessory for the flash circle burner. With the use of this cold-rolled steel bar, circles may be cut up to 60 in. in diameter. Larger circles (to any diameter) can be accurately cut by joining several extension bars together.

Bar has an adaptor permanently fixed to it by induction silver soldering. An aluminum setscrew with cut threads is set diagonally on the adaptor, creating a firmer hold on the joining bar. SCIENTIFIC RESEARCH CO., Box 343, 1618 N. Vancouver Ave., Portland 12, Ore.

Acetylene Generator



ECONOMY and efficiency are features of acetylene generator

A NEW all-welded acetylene generator operates on the principle of spring pressure opposed to gas pressure. It is said to produce an even flow of acetylene not to exceed 15 lb pressure. Carbide is fed from the hopper into a water tank, and acetylene flows to the service valve through a flashback arrester. Hopper employs a "twist lock" method of mounting to the tank. Design is such that it is impossible to refill hopper without removal from tank for cleaning at each recharging operation. The tank valve plus "easy action" agitator is said to assure quick drainage. THE BURDETT OXYGEN CO., 3302 Lakeside Ave., Cleveland 14, O.

* * *

ASSEMBLIES of children's scooters are welded by this multiple machine

Multiple Welder

A MULTIPLE spot welder developed for the special purpose of welding scooter assemblies consists of two welders mounted opposite each other, each with a set of eight opposing electrodes. Each welding unit houses two transformers and electronic controls are mounted in a cabinet at one end. A chute for gravity feed passes through the center of the machine—if chute is kept full, the scooter wheels drop into welding position and automatically initiate pressure cylinders and current.

Overload on the power supply is avoided by dividing the complete weld into two firings. Upon completion of welding, the electrodes retract and the welded part drops on a belt which loads into a bin. Other applications of this machine might be pulley wheels, brake drums, etc. SCIAKY BROS., INC., 4915 W. 67th St., Chicago 38.

new RUF-TRED welding attachment

for low cost safety underfoot

quickly and easily welds slip-proof beads to any iron or steel surface

The RUF-TRED tool is a vibrating electrode holder that deposits rough, foamy bead lines with a distinctive "gripping" quality that prevents slipping accidents. Metal is file-hard and will outwear new plates or treads.

Simple - Fast - Economical

No arc need be "held," as in ordinary welding. Five feet of bead per minute is deposited merely by drawing the electrode over the iron or steel surface to be roughened. Total cost, including labor, material and electric power, averages only 7c per square foot slip-proofed.

For use with any electric welding machine—either AC or DC.

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Ni-Rod's easy-to-control arc speeds up all kinds of cast-iron repair work. Cuts labor, time, and costs. Raises welders' success scores on tough jobs.

Ni-Rod gives you thorough fusion . . . close color match . . . smooth bead that sheds slag. Works on A.C. or D.C.

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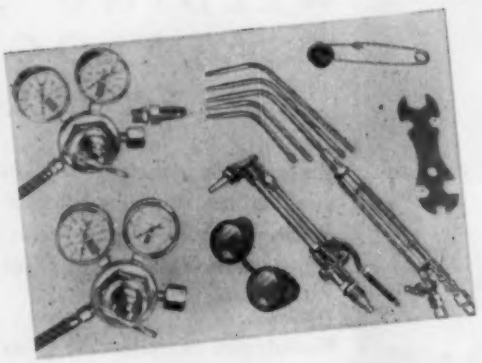

A General Purpose Welding and Cutting Outfit

• DOCKSON'S #145 outfit shown above is versatile and handy . . . capable of handling almost any light or medium welding or cutting job up to 3-inch steel. The #145 is designed and constructed for long, trouble-free service. Scientifically balanced for effortless operation. • It's a quality kit at low cost.

(Write for welding and safety catalogs.)

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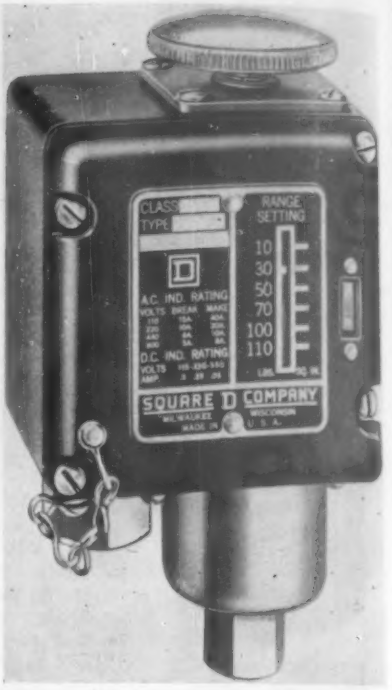


PRESSURE switch for welding. Operating rates are up to 300 per minute

Welder Pressure Switch

DESIGNED for use in the control circuits of welding equipment, machine tools and high-pressure lubricating systems, a new pressure switch with a positive quick-make and quick-break action operates up to 300 times per minute without false operation or flutter, as confirmed by actual operation tests. The trip indicator operates behind a window in the cover that permits observation of switch action. The indicator flag facilitates proper setting of the trip point and immediately indicates any pressure surge or other condition which might be objectionable.

Adjustment of the operating point is made externally by using either a screwdriver or an adjusting knob which can be furnished. SQUARE D Co., INDUSTRIAL CONTROLLER DIVISION, 4041 N. Richards St., Milwaukee 12.

* * *

PERMANENT magnets in this angle and level hold tool for operator

Magnetized Level

"MAGNO Level" is a combined level and angle recommended for weldors, steam fitters or anyone who works with metal. Permanent magnets hold the in-

strument to a flat or round metal surface, permitting the operator to have both hands free for lining up, straightening or fastening work in place. The level is calibrated to show angles from 0 to 360 deg and it is made of aluminum with plastic dial. THE BUCKEYE PLASTIC CORP., 1220 Huron Road, Cleveland 15.

* * *

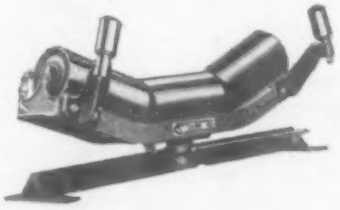
SHEET METAL up to 1½ in. can be welded with "Airco 800" torch

Welding Torch

"AIRCO 800," a new ocyacetylene welding torch, is said to be suited for almost any welding job from the thinnest sheet metal up to 1½-in. plate. Weighing 1½ lb and 11½ in. long, the new torch has a capacity for operating single-flame welding tips from Nos. 0 to 13 inclusive and multiflame tips up to No. 15.

Advantages of the new torch are: (1) each tip is assembled with an individual mixer drilled for that particular size tip, assuring better flame control and weld results; (2) torch is made of durable, long-wearing Monel metal; (3) Light weight coupled with flexible hose assures good balance and ease of manipulation.

* * *

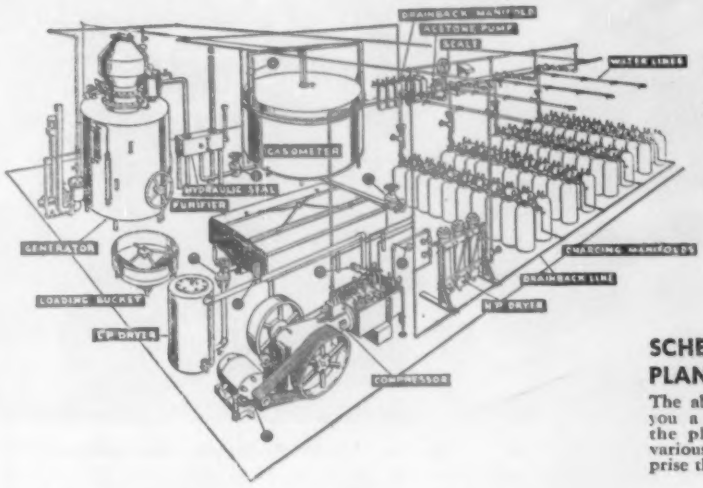


SELF-ALIGNING idler suitable for troughed, flat and return belts

Self-Aligning Idler

AN improved self-aligning belt conveyor idler is made in designs suitable for troughed, flat and return belts. Construction features include heavy-duty Timken bearings on the 1¼ in. swivel shaft, grease pipes extending to one side for ease and safety of lubrication, and hydraulic fittings as standard equipment, with other fittings offered if required. It is not necessary to cut into the deck plate to mount the troughing idlers, states manufacturer. CONTINENTAL GIN Co., Industrial Division, Birmingham, Ala.

A *Low Pressure* ACETYLENE PRODUCING PLANT that Charges up to 160 CYLINDERS at ONE TIME



SCHEMATIC PLANT ASSEMBLY

The above sketch gives you a general view of the placement of the various units that comprise the plant.

For the Prospective Gas Manufacturer this complete plant layout provides for extremely *simple* operation and exceptionally *low* maintenance costs. The entire plant is designed to provide ample storage room for filled tanks and compact enough for the Chief operator to observe all operations. Rated capacity, 2700 cu. ft. per hour.

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CYLINDERS AND GAS PRODUCING EQUIPMENT
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"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes produce no injurious fumes to irritate eyes or nose of the operator.

Write on your company letterhead for a generous sample stating which FLUXINE Flux you desire.

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No. 4 FLUXINE, in powder form, for welding cast iron with bronze rods.

No. 7 FLUXINE for welding all types of aluminum.

No. 18C FLUXINE for gas and atomic hydrogen welding of stainless steels and inconel.

No. 41 FLUXINE used with high-melting silver solders on copper and its alloys and on steel.

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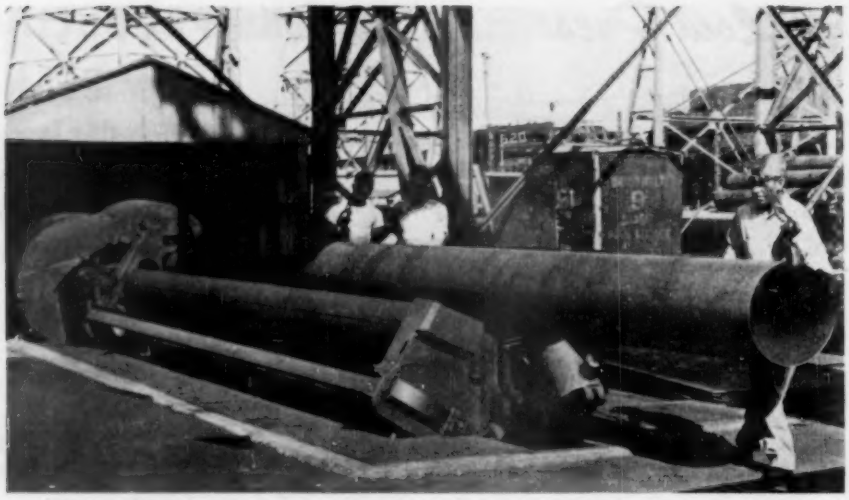
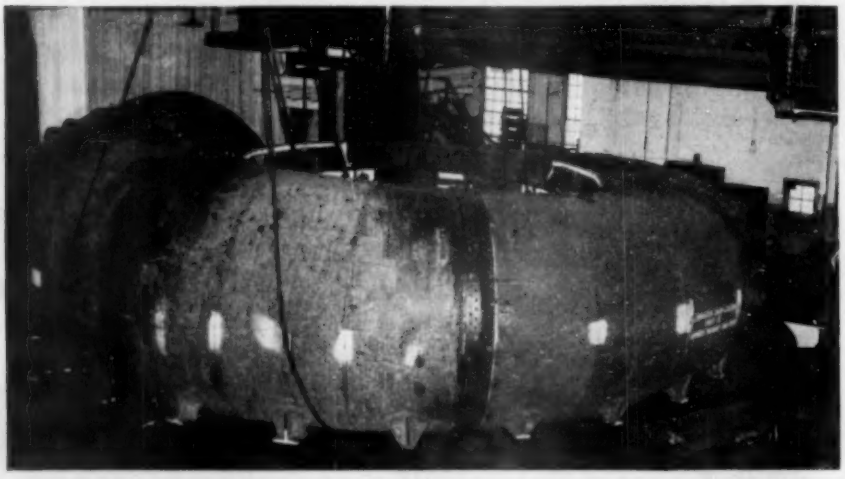
FLUXES TO JOIN ALL METALS



AUTOMATIC SEAM WELDER developed at Ingalls Pascagoula, Miss. shipyard for tanks or large pipe ranging from 20 in. by 50 ft to 12 ft diam. and 50 ft long



ADDED POWER in the making! This is not the largest French horn in the world but the spiral casing of a 103,000-hp hydro-electric turbine for Shasta dam. The cranes are about to lift the 360,000-lb casing to a 40-ft boring mill in the Allis-Chalmers shops

OFFICERS AND TRUSTEES, National Welding Supply Association, elected at annual meeting in St. Louis (see page 54). Seated, left to right: Howard R. Proctor, Acme Welding Supply Co.; E. C. Caluwaert, O. K. I. Welding Supply Co.; Senior Vice-President R. S. Mars, W. P. & R. S. Mars Co.; President Ralph E. Chase, Chase Welding Supply Co. Inc.; J. W. Albiston, Maine Oxyacetylene Supply Co.; George Sommerfeld, Sommerfeld Welders Supply; standing, Secretary-Treasurer Robert C. Fernley; Hal Savage, Arizona Welding Equipment Co.; Ray Tarbell, Scott-Tarbell, Inc.; W. J. Bentley, Bentley Sales Co.; Glenn G. Garman, Purity Cylinder Gases, Inc.; R. W. Metzger, Compressed Gases of Ohio, Inc.; V. S. Rice, Virginia Welding Co.; W. R. Boyd, Boyd Welding Co., and R. C. Waldie, Williams & Co. Inc. Convention was held May 20-21 at the Sheraton Hotel

News of the Industry

Shipyard Develops Own Pipe Welder

A NEW automatic machine capable of welding longitudinal or circumferential seams on pipes or tanks ranging from 20 in. to 12 ft in diameter and up to 50 ft length has been built by the Ingalls Shipbuilding Corp., Pascagoula, Miss. It was planned by T. J. Tyson, Ingalls plant engineer, and developed and constructed by C. A. Guynn, superintendent of maintenance. Entire operation of the automatic welder is by remote control by a single operator from one position at the control head.

* * *

Welded Spiral Built for Shasta Turbine

A 360,000-lb spiral casing of welded construction is now being built at the West Allis works of the Allis-Chalmers Mfg. Co. for the fifth hydro-electric turbine of Shasta dam, a part of the Bonneville power development in Oregon. The casing measures 56 ft across and consists of seven sections with riveted buttstrap joints. Speed ring portion has an ID of 18 ft, and the inlet section (fading toward the far wall at the left end of the casing in picture) has an ID of 12 ft 8 in. and is made of 1 7/8-in. plates.

The big unit will be shipped to join four other Allis-Chalmers turbines at Shasta, all rated 103,000 hp at 138½ rpm under a 330-ft head of water.

* * *

High-Strength Steels Alleviate Shortage

MANUFACTURERS of finished steel products are said to be turning in numbers to the use of high-strength steels. In the past year Carnegie-Illinois Steel Corp. has shipped 80% more high-tensile steel to customers than in previous years.

Manufacturers are substituting the low-alloy, high-strength steels in applications ranging from freight cars and auto parts to refrigerators, hot water tanks and other industrial and home uses.

A certain producer of refrigerator cabinets formerly used 220 tons of carbon steel to produce 12,000 wrap-around sheets (the body of the box). He now produces the same number from 160 tons of high strength steel, saving 60 tons. In the industrial field, a manufacturer of compressed gases found that 500 tons of high-strength steel sheets were sufficient for 10,000 propane cylinders, while the same tonnage of carbon steel made only 7,500 cylinders.

Opens Attack On Code Restrictions

WELDING construction is being severely handicapped, states James F. Lincoln, president, The Lincoln Electric Co., Cleveland. According to Mr. Lincoln, code writers are putting restrictions of great expense but no great value on welded structures. As examples, he cites the following illustrations under existing codes:

If a welded joint is made of equal strength or equal ductility to a riveted joint, the riveted joint is accepted, the welded joint rejected.

If a welded joint is made with the same undercut from calking as is normally done in a riveted joint, the riveted joint is accepted, the welded joint rejected. The same is true of a welded joint made with the same porosity as a riveted joint. If magnetic-particle or X-ray inspection shows the same voids on welded and riveted joints, the welded joint would be rejected, the riveted joint accepted.

If a welded joint is made with the same surface appearance as a riveted joint, again the welded joint would be rejected, the riveted joint accepted.

If a welded joint is made with the same fatigue value and tightness as a riveted joint, the riveted joint would be accepted, the welded joint rejected.

If a welded joint is made with the same tendency toward caustic embrittlement as a riveted joint, the welded joint would be rejected, the riveted joint accepted.

* * *

Acro Welder Sold to New Group

ACRO WELDER MFG. CO., Milwaukee, has been sold to a group headed by J. C. Wilson, Jr., formerly executive vice-president of Burlington Mills, Inc., Burlington, Wis. Mr. Wilson will be president of the reorganized Acro, which will continue the manufacture of spot, seam, projection and other resistance welders. L. R. Matthews has been elected vice-president; W. C. Messinger, secretary; J. C. Wilson, Sr., treasurer; and T. B. Wilson, assistant secretary-treasurer.

Associated as stockholders in the new organization are: R. E. Brooks, board chairman of Cleaver-Brooks Co., Milwaukee; O. W. Carpenter, vice-president of Chain Belt Co., Milwaukee; William M. Chester, Jr.; Joseph F. Heil, Jr., president The Heil Co., Milwaukee; D. E. McKey, vice-president of Burlington Mills, Inc.; G. H. Messinger; A. H. Torhorst, a partner in Quality Milk and Frate Service, Burlington; and C. P. Wilson. The senior J. C. Wilson is vice-president of Cutler-Hammer, Inc.

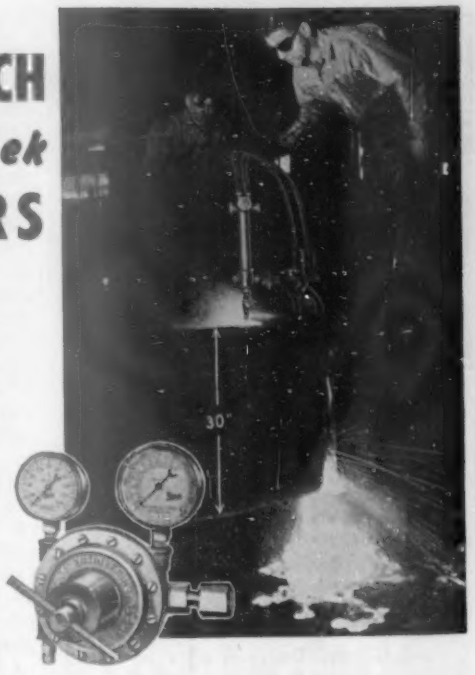
* * *

Correction

The item on "Flux Recovery" in the Free Literature section of the May, 1948, issue of THE WELDING ENGINEER was given as published by the Vacuum Cleaner Mfg. Co., Dover, O. The company name should have been The Invincible Vacuum Cleaner Mfg. Co.

BEHIND the TORCH

Meco Safe-T-Chek REGULATORS



The success of a cutting job of this size depends upon huge volumes of oxygen at hard to handle low pressures. Controlling these pressures is no problem with Meco Safe-T-Chek Regulators. Their engineered design and precision construction assure accurate, unfailing regulation. Rugged simplicity, sturdy construction and built in safety features assure utmost dependability.

Type FC Master Regulator for heavy cutting and welding or manifold hookups.

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Solder and Braze Aluminum Easily and Quickly with Gas or Carbon Arc . . .

ALADDIN ROD

Melting Point 732° F. Tensile Strength lbs/Sq. in. 47,300. Shearing Strength lbs/Sq. in. 45,800. Meets Air Corps Specification No. 10302. Instructions with every pound. Sizes 1/32", 1/16", 1/8", 3/16", 1/4", and Complete Assortment.

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GLOVES

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GARMENTS

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OUR LEATHER IS SPECIALLY TANNED FOR HEAT RESISTANCE AND LONG WEAR

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DEERSKIN — CHROME TANNED FOR SOFTNESS

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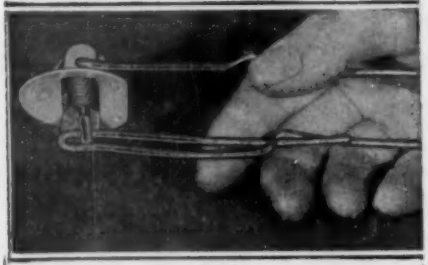

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Lynn, Massachusetts
Established 1901

Researchers Go to Work on Many Welding Problems

WELDING Research Council, a project of the Engineering Foundation, New York City, will direct investigations toward some of the problems resulting from the accelerated use of welding during the war. Long-term research includes studies of weldability, structural steel, weld stresses, resistance welding and pressure vessels. These studies will deal with materials used in the construction of bridges, buildings, ships, airplanes, etc.

The research in weldability, being conducted at Lehigh University, Rensselaer Polytechnic Institute, Battelle Memorial Institute, University of California and Massachusetts Institute of Technology, will aim to evaluate the ductility of various metals as influenced by the welding process. Studies are also being made of the conditions under which various metals become brittle.

Projects on structural steel include static load tests of heavy box girders. These are being made at the National Bureau of Standards to determine load capacity, energy absorption and general behavior of steel at various temperatures. (see "Big Beams Break and Bend." THE WELDING ENGINEER, February, 1948).

At Columbia University, research workers have finished tests to learn whether residual stresses due to welding could combine with load stresses to cause premature failure under impact before stress peaks could be ironed out by plastic deformation. With these tests as a guide, an investigation is being made of the behavior of various kinds of structural carbon-steel materials in plain or welded steel beams at various temperatures, including low winter temperature.

M. I. T. is conducting a study on the stability of welded compression elements with the idea of obtaining basic data which can be used in codes to specify optimum and minimum spacings for lengths of welds and proportions of welded elements.

In an effort to evaluate the true load capacity of steel frames and members, an analysis is in process at Lehigh of the plastic as well as the elastic behavior of beams, columns and connections in rigid frames.

An investigation of the effects of peening will be carried out at the American Bureau of Shipping Research Laboratories. Its purpose will be to establish or disprove the necessity for certain peening requirements—such as elimination of peening of the last layer—in welding codes applicable to field-erected structures like tanks, bridges and ships.

* * *

Raytheon Moves New York Divisions

RAYTHEON MFG. Co. has moved its equipment sales division, International division, the Russell Electric Co. and Submarine Signal Co., to 50 Broadway, New York City. Publicity department and broadcast equipment sales remain at 60 E. 42nd St., N. Y.

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from your Welding Torch
with a

BINGO
SOLDER KIT

Easy to Use . . . Bingo slips on over the tip of your welding torch and uses acetylene only

Efficient . . . Provides and air-acetylene flame that is ideal for body soldering, tinning and silver soldering

Economical . . . Comes complete with No. 1 and No. 2 tips for only $2.75 Savings in oxygen alone will soon pay for this kit

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WOOLDRIDGE ALFLUX No. 3 CAST ALUMINUM BRAZING FLUX

ALFLUX No. 3 is a multiple purpose flux which has been developed especially

for Soldering	*and Brazing*
Steel to Aluminum	**Aluminum castings**
Copper to Aluminum	**Aluminum Sheets**

This flux may also be used with good results on other metals. ALFLUX No. 3 is manufactured of the highest quality pure chemicals which have been thoroughly and carefully compounded. It is an exceptionally fine flux which adheres to the surface to be brazed and produces a faster and more economical weld.

WOOLDRIDGE ALUMINUM WELDING PRODUCTS, INC. Glastonbury, Conn.

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WELDERS' CLAMP

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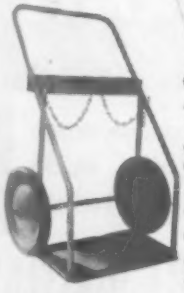
GAS CYLINDER TRUCK
"SMOOTHEST TRUCK AFLOAT"

3 MODELS



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EXCELLENT WINDOW SALES APPEAL FOR YOUR GAS AND APPARATUS.

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NATIONAL WELDERS SUPPLY CO.
Charlotte 1, N. C.

Nelson Stud Welding Sold to Morton-Gregory

PURCHASE of the Nelson stud-welding interests from Ted Nelson, the 40-year-old inventor who developed stud welding eight years ago while working as a $11 a day weldor in the Mare Island Navy Yard, marks a climax in one of the most picturesque industrial sagas of the war period. Manufacturing assets and patent interests of the Nelson Stud Welding Corp. and associated companies have been purchased by the recently formed Morton-Gregory Corp., Toledo, O.

Founders of this new corporation are Henry J. Morton of Detroit, president, and George E. Gregory, Toledo, vice-president and general manager. Mr. Morton, widely known consulting electrical engineer and one of the editors of the National Electric Code, has served as consultant to the Association of Edison Illuminating Companies, the Edison Electric Institute, the Owens-Corning Fiberglas Corp., and the John B. Pierce Foundation of New York.

Mr. Gregory, one of the pioneers in the commercial development of Fiberglas, resigned as vice-president of Owens-Corning Fiberglas Corp. several months ago to accept the general managership of the new firm, in which a number of prominent Detroit and Toledo banking, industrial, automotive and construction executives are interested.

Horace S. Maynard of Detroit, who is associated with the Fred J. Fisher Estate and is secretary and a director of the Udylite Corp., is secretary-treasurer. Also serving with Morton, Gregory and Maynard on the firm's board of directors are: Martin G. Chapin, Sr., vice-president and director of The Metal Specialty Co., Cincinnati; Raymond T. Perring, vice-president of the Detroit Bank; Edwin C. Lewis, senior partner of Lewis & Watkins, Detroit legal counsel; William J. Kane, formerly sales manager of the industrial division of Owens-Corning Fiberglas Corp., who will act in the capacity of sales manager of consumer products for Morton-Gregory Corp.; Dr. Vernon C. Abbott, Pontiac, Mich.; and William Sinclaire, an officer of Corning Glass Works.

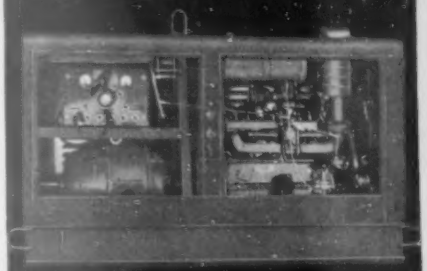
Nelson manufacturing and engineering activities will continue to be centralized at the Lorain, O., plant as the Nelson Stud Welding Division of Morton-Gregory Corp. Nelson's staff of field engineers and its 18 engineering offices will be continued as part of this division.

* * *

Road Show to Exhibit Biggest Dragline Bucket

VISITORS to the 1948 Road Show at Chicago's Soldier's Field, July 16 to 20, will be afforded an opportunity to view the world's largest dragline bucket. In addition to this 30-cu-ft bucket, made by the Page Engineering Co., Chicago, the American Road Builders' Association will have on display huge shovels, bulldozers, scrapers and other machinery used in the construction and maintenance of public roads and streets.

FOR STEADY
ROUND • THE • CLOCK



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The DUALARC DC welding generator is dual-controlled, self-excited, and ball-bearing equipped. Gives positive assurance of adequate voltage and amperage for any welding requirement. NEMA rated. Optional equipment to supply 110 volts AC for lights and auxiliary power for "off-power-line" operation.

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FOR CAST ALUMINUM

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for Better Welding

3/16" size only

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- No. 2 Brazing Flux for Brass, Bronze, etc.
- No. 4 "Brass-Cast" Flux for Bronze Welding Cast Iron
- No. 5 Aluminum Flux for Cast Aluminum
- No. 8 Aluminum Flux for Sheet Aluminum
- No. 9 Stainless Steel Welding Flux
- No. 11 Tinning Compound
- No. 16 Silver Solder Paste Flux

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FORT WAYNE, IND.

Whitehead Metal Products Holds Welding Clinic

A TOTAL of 2,612 registered welding enthusiasts attended the three-day Welding Show and Clinic held by Whitehead Metal Products Co. at its main office and warehouse in New York, May 13, 14 and 15. Despite unfavorable weather, the attendance was better than in former years. Local aircraft concerns with orders for jet planes showed renewed interest in specialized welding equipment. One exhibitor reported that a large aircraft manufacturer had just placed orders for $300,000 worth of spot and seam welders.

Twelve manufacturers participated in the show with on-the-spot demonstrations of their process or products. Each exhibitor also had a technician on hand to aid visitors with specific welding problems.

One of the high spots of the clinic was a demonstration of welding techniques utilizing Inconel and alloys for use in jet planes and other applications. This exhibitor reported a sharp upturn in sales of high-nickel alloys. Another feature was a showing of five educational films on welding and brazing aluminum and the manufacture of clad steels.

At least 40% of the visitors were from outside the area normally served by Whitehead. There was even a visitor from Norway. A humorous sidelight was the visit of the housewife who, hearing there was a welding clinic on, brought in a damaged aluminum ice-box tray to be repaired—and it was.

* * *

Titan Metal Opens New Mill Depot

TITAN METAL MFG. CO., Bellefonte, Pa., has opened a new mill depot at 140 Madison Ave., Indianapolis, Ind., under the direction of Samuel D. Rhinesmith. A complete line of brass rods, including free turning brass rods and Naval brass rods in rounds, hexagons and rectangles, is stocked.

Titan's two mill depots at Indianapolis and Bellefonte are within 300 miles of the major industrial centers in north central and northeastern United States. A total of 3,000,000 lb of brass rods is stocked at these two points.

* * *

New Editor Joins Welding Engineer

WILLIAM C. HENZLIK, formerly associate editor of the *Industrial Bulletin*, has joined THE WELDING ENGINEER as assistant editor. Mr. Henzlik is a native of Norfolk, Neb., and holds degrees in engineering and journalism from Iowa State College and the University of Missouri, respectively. During the war he served with the U. S. Navy in the Marianas Islands.

He succeeds JACK GIROUX, associate editor, who has accepted a sales position with Steele Gases, Inc., Chicago, manufacturer of industrial gases.

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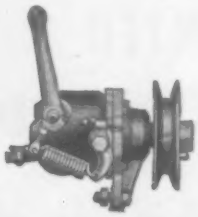

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About People

JACK ELLSWORTH has been placed in charge of both Chicago and Detroit territories of Tube Turns, Inc. He has moved his headquarters to 600 So. Michigan Ave., Chicago. Mr. Ellsworth succeeds GEORGE ANDERSON, resigned.

* * *

Two new members were recently elected to the Board of Directors of the Lincoln Electric Co. They are W. R. PERSONS, general sales manager, and K. F. STEINGASS, superintendent electrode manufacture.

* * *

Directors of the American Welding and Manufacturing Co. recently made the following appointments; E. W. WILHELMY to the newly created post of vice-president of finance, E. C. FALES, vice-president in charge of operations, to the post of executive vice-president and HENRY H. ALDEN as treasurer and assistant secretary.

* * *

LESTER M. CURTISS, general manager, steel plant, of Lukens Steel Co., has assumed the position of general works manager of the company and its divisions, By-Products Steel Co. and Lukenweld.

* * *

WENDELL G. FOGG has been appointed executive engineer for Air Reduction Sales Co. Mr. Fogg will assist in the planning, co-ordination and review of the activities of the research and engineering department.

* * *

MAX TATMAN, a member of the research division of Permanente Metals Corp., Spokane, Wash., was recently elected chairman of the Inland Empire section of the American Welding Society. The newly-elected executive committee includes FRED MILLER, GLEN WILSON, ADRIAN LONG, MACY FORSYTH and JOHN KING of Spokane and EUGENE LAVELLE.

* * *

J. L. STANFORD, formerly advertising and sales promotion manager for the automotive division of Thomas A. Edison, Inc., has accepted the position as head of Square D Company's switch & panel division, advertising section.

* * *

MAYNARD B. TERRY is now general manager of the American Brakeblok division of American Brake Shoe Co.

* * *

H. S. HAGAN has been named acting manager of the Butler, Pa., plant of Pullman-Standard Car Mfg. Co., replacing R. M. Fox, works manager, who has been granted a leave of absence.

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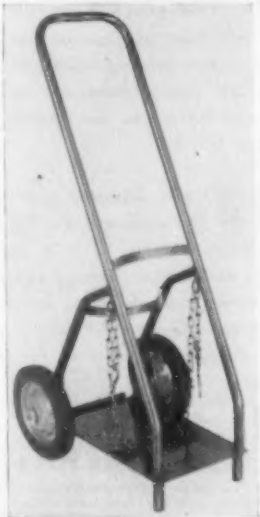

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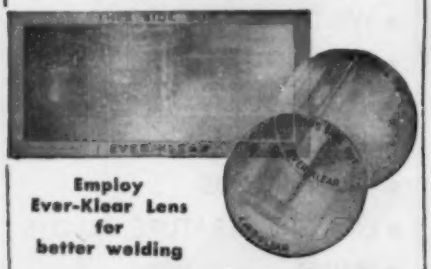

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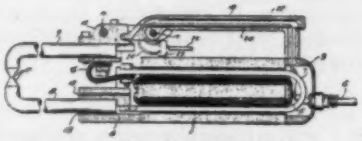
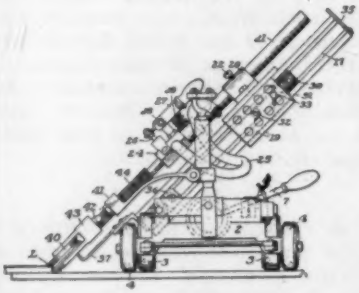


Portable Spot Welder

2,441,438. ALLEN C. MULDER, Appleton, Wis., assigned to MILLER ELECTRIC MFG. Co., Appleton, Wis. Filed March 16, 1948. Issued May 11, 1948.

A manually operated portable spot welder comprising a body made up of a plurality of laminations forming the core of a transformer with hollow end caps bolted together. A pair of spot welding tongs is carried by one of the end caps while a primary coil is disposed in the core and a secondary turn adjacent the primary coil to provide a transformer. Connections through one of the end caps between the terminals of the secondary turn and the corresponding tongs supply welding current to the latter. One of the tongs is pivotally secured to the end cap near one side to pivot toward and away from the other tong. A fixed handle extends parallel to the side of the body containing tong pivot and secured to both end caps and centrally spaced from the body. An operating lever overlaps the handle and is pivoted to the end cap which carries the pivotal tong. The lever being connected to the pivotal tong to operate the latter when manually pressed toward the handle. Connected to this tong is a lever for operating it when pressed toward the handle.

* * *



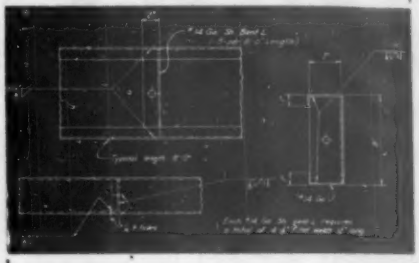
Arc Welding Apparatus

2,439,740. WALLACE C. JOHNSON, Sewickley, Pa., assigned to DRAVO CORP., Pittsburgh. Filed Dec. 29, 1943. Issued April 13, 1948.

A welding apparatus of the type wherein a coated electrode is traversed along the work. It has a movable carriage with a guide and an electrode holder movable by gravity along the guide, and an adjustable friction brake means for retarding the movement of the holder.

WANTED QUICK WELDING

We are interested in machine or methods to weld on a production basis 8" x 3" x No. 12 gauge bent angles to No. 14 gauge hot rolled sheet without warping. Please advise machine costs, labor costs, and time required to make delivery. Steel design can be modified.



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